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MANITOBA Pulse Soybean GROWERS

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2021 ON-FARM RESEARCH RESULTS

DECEMBER 2021

Thank you to all participants!

Thank you for your participation in the On-Farm Network!

This growing season, with your participation and support, a total of 114 on-farm trials were completed across Manitoba through MPSG and MCA. We would like to thank each of you for your interest in conducting on-farm research and we hope to help facilitate future research trials on each of your farms.

In this book you will find important information for interpretation of single-page reports followed by summary tables and reports for 2021 trials, arranged by trial type. The contents of this booklet are for individual trial-by-trial results only; combined and overall analyses are on-going. Keep an eye out for this at future events and in publications such as MPSG's *Pulse Beat* magazine.

Along with this booklet, additional information is available. Single-site reports from 2012 to 2021 can be found in MPSG's On-Farm Network database at manitobapulse.ca/on-farm-network/on-farm-research-reports and on MCA's website at mbcropalliance.ca/research/on-farm-research. Summary videos of each trial type are available this year in lieu of an in-person meeting. They may be viewed at https://www.manitobapulse.ca/on-farm-network/on-farm-network-results-series/.

Thank you for your participation and continued support. This farmer-first research would not be possible without you!

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Research on the Farm

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Important Information to Interpret On-Farm Network Single Page Reports

On-Farm Network field trials are set up using a randomized complete block design (RCBD). Analysis of variance (ANOVA), treating site as a fixed effect and replicate (block) as a random effect, or t-tests, have been conducted to determine yield results. All single page reports and summaries within this document are based on a single-site analysis, i.e., site-years are not combined. Therefore, the effect of treatment across site-years should not be interpreted until a combined analysis has been presented.

Definitions

Site-year: A site-year, identified by a unique trial ID, is one research trial location in one year. For example, a seeding rate trial conducted in a field near Carman would be one site-year.

Confidence level: A 95% confidence level is used within our trials. This means we can say we are 95% certain of the outcome.

P-value: A calculated probability used in statistics to either accept or reject the null hypothesis. The null hypothesis for our trials is that there is no difference between treatment means. A p-value of less than 0.05 suggests that there is enough evidence to reject the null hypothesis, meaning there is a significant difference between treatments. If the p-value is greater than 0.05, then there is not enough evidence to conclude that the observed treatment differences are due to our applied treatment at a 95% confidence level.

Coefficient of Variation (CV): The statistical measure of random variation in a trial. The lower the value, the less variable the data.

Contacts and Questions

For any questions about existing trial data, data analysis, or for assistance with future trial establishment of an existing or new trial type, please contact your commodity organizations.

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Dry Bean Foliar Fungicide Trials

Objective: Quantify the agronomic and economic impacts of a single foliar fungicide application in dry beans.

Summary: There was no significant yield difference between dry beans with and without a single or double application of foliar fungicide.

Summary of 2021 dry bean foliar fungicide trial yield results by site-year.

Trial ID	Rural Municipality	Bean Class	Product	Seeding Date	Yield		Yield Difference	CV	P-Value	Statistically Significant @ 95%
					Treated	Untreated				
					lb/ac		lb/ac	%		
DBF01	Rhineland	Pinto	Lance WDG	May 27	2192	2242	-50	2.1	0.1856	**No**

Trial ID	Rural Municipality	Bean Class	Product	Seeding Date	Yield		Yield Difference	CV	P-Value	Statistically Significant @ 95%
					Single	Double				
					lb/ac		lb/ac	%		
DBF06	Swan Valley West	Black Bean	Acapela / Dyax	May 28	1623	1709	86	11	0.4865	**No**

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Dry Bean Fungicide Trial

Trial ID: 2021-DBF01 – R.M. of Rhineland

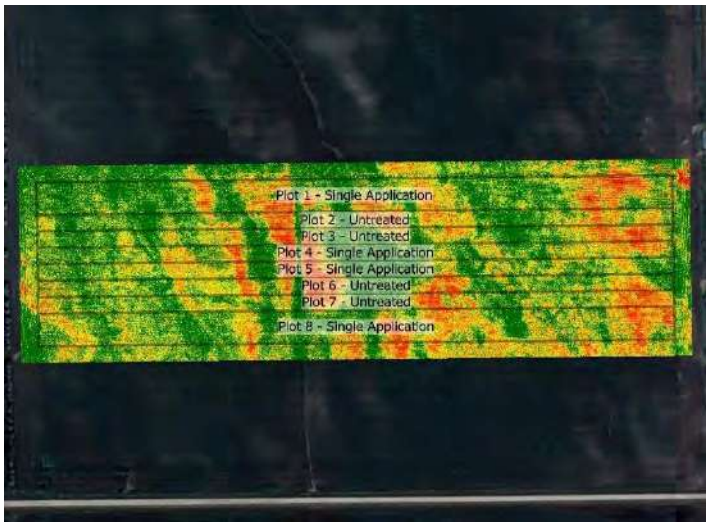
Objective: Quantify the agronomic and economic impacts of a single foliar fungicide application in dry beans

Summary: There was a high incidence of foliar and stem anthracnose throughout the trial, however, the severity was low. There was no white mould at this site. As a result of light overall disease pressure, there was no significant yield difference between pinto beans with and without a single application of Lance WDG. Due to the lack of yield response, there was a decrease in profit/ac in the treated area of the trial, equivalent to the cost of the fungicide application.

Trial Information

Treatment	Lance WDG
Application Timing	R2
Application Date	July 22
Application Rate	0.2264 kg/ac
Application Method	Broadcast
Soil Texture	Loam, Clay Loam, Very Fine Sandy Loam
Previous Crop	Barley
Seeding Date	May 27
Variety	Vibrant Pinto Bean
Seeding Rate	90 000 seeds/ac
Row Spacing	30″
Plant Stand @ R4	70 000 plants/ac
Harvest Date	September 8

Field NDVI Image August 13



Summary of Disease Risk†

Category	Rating	Explanation
Weekly total rainfall pre-flowering (up to V4)	2	0.1-0.5″
Average daily high temp. pre-flower	2	18-21°C
Humidity (%) or hours of dew on foliage	3	51-75% (< 18 hrs)
Forecasted/actual rainfall expected (V4-R4)	2	0.1-0.5″
Forecasted/actual daily high temp. (V4-R4)	1	> 28°C
Susceptible host in the rotation (dry bean or other, ex. canola, sunflower)	2	< 3 years
Susceptible hosts and/or fungal apothecia observed nearby (<2km) before flowering (R1)	2	Apothecia or hosts
Timing and amount of N fertilizer applied	1	Planting < 100 lbs/ac
Plant spacing, canopy density and microclimate conditions	1	Wide rows, low-moderate density
Varietal reaction to white mould	1	Resistant
Total Score	**17**	**Reduced Risk**

†Based on the foliar fungicide decision making worksheet for managing white mould in dry beans

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Precipitation (mm)

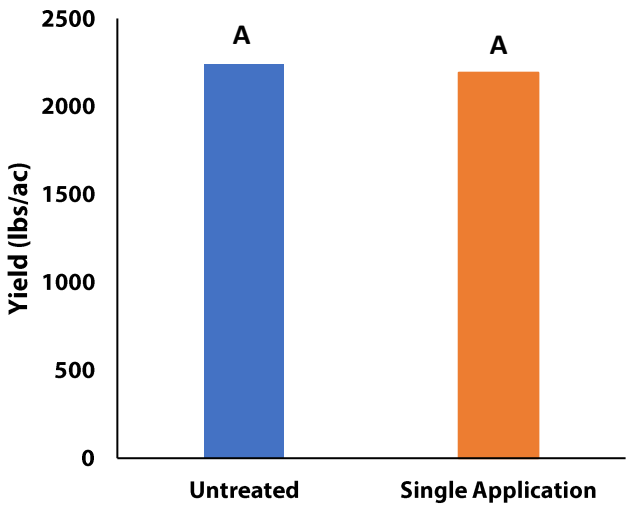
	May	Jun	Jul	Aug	Total
Rainfall	46.3	63.6	32.3	142	284
Normal	56.4	85.2	75.4	65.5	282.5
% Normal	82%	75%	43%	216%	101%

Summary of Disease Rating (R3)ǂ

	Foliar Anthracnose		Stem Anthracnose		White Mould	
	UN	SGL	UN	SGL	UN	SGL
Incidence	73%	63%	85%	83%	0%	0%
Severity	0.7	0.6	n/a	n/a	0.0	0.0

ǂ SGL=single application; Foliar anthracnose 0-9 rating scale, stem anthracnose (presence/absence), white mould 0 – 5 rating scale; bacterial blight present throughout the trial.

Yield by Treatment



Overall Yield & Economics

	Mean (lbs/ac)	Costǂ	Change in Profit/acǂǂ
Single Application	2192	$17/ac	- $17/ac
Untreated	2242		
Yield Difference	-50		
P-Value	0.1856		
CV	2.1%		
Significance	**No**	**Economic**	**No**

ǂ Estimated cost; represents product only, does not include application cost

ǂǂ Because yields were not significantly different, there is no increased income to offset the cost of the fungicide. Profit/ac declines by the cost of the fungicide application.

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Dry Bean Fungicide Trial

Trial ID: 2021-DBF06 – R.M. of Swan Valley West

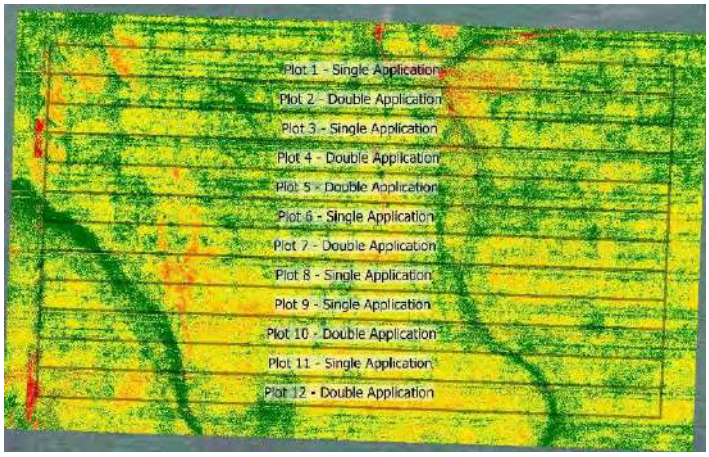
Objective: Quantify the agronomic and economic impacts of a double vs. single foliar fungicide application in dry beans

Summary: There was no anthracnose or white mould pressure at this trial. As a result of low disease pressure, there was no increase in yield with a double fungicide application compared to the single application. As a result, there was a decrease in profit/ac, equivalent to the increased cost of the double fungicide application.

Trial Information

Treatment	Acapela / Dyax
Application Timing	Early Flower / Full Flower
Application Date	July 20 / July 30
Application Rate	350 ml/ac / 0.4 L/ha
Application Method	Broadcast
Soil Texture	Clay Loam
Previous Crop	Canola
Seeding Date	May 28
Variety	Blackstrap
Seeding Rate	75 lbs/ac
Row Spacing	10″
Plant Stand @ R4	91 000 plants/ac
Harvest Date	September 24

Field NDVI Image August 17



Summary of Disease Risk†

	First Application		Second Application	
Category	Rating	Explanation	Rating	Explanation
Weekly total rainfall pre-flowering (up to V4)	3	51-75% (< 18 hrs)	3	51-75% (< 18 hrs)
Average daily high temp. pre-flower	2	0.1-0.5"	2	0.1-0.5"
Humidity (%) or hours of dew on foliage	3	51-75% (< 18 hrs)	3	51-75% (< 18 hrs)
Forecasted/actual rainfall expected (V4-R4)	2	0.1-0.5"	2	0.1-0.5"
Forecasted/actual daily high temp. (V4-R4)	2	22-28°C	2	22-28°C
Susceptible host in the rotation (dry bean or other, ex. canola, sunflower)	2	< 3 years	2	< 3 years
Susceptible hosts and/or fungal apothecia observed nearby (<2km) before flowering (R1)	2	Hosts OR Apothecia Nearby	2	Hosts OR Apothecia Nearby
Timing and amount of N fertilizer applied	1	Planting < 100 lbs/ac	1	Planting < 100 lbs/ac
Plant spacing, canopy density and microclimate conditions	3	Narrow rows, moderate density	3	Narrow rows, moderate density
Varietal reaction to white mould	2	Unknown	2	Unknown
Total Score	**22**	**Moderate Risk**	**22**	**Moderate Risk**

†Based on the foliar fungicide decision making worksheet for managing white mould in dry beans

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Precipitation (mm)

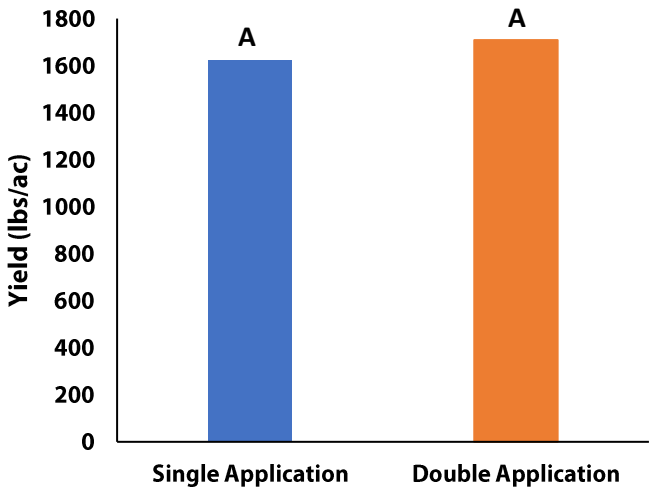
	May	Jun	Jul	Aug	Total
Rainfall	38.5	64.1	56.8	73.7	233.1
Normal	45.4	84.2	85.6	68.3	283.5
% Normal	85%	76%	66%	108%	82%

Summary of Disease Rating (R4)ǂ

	Foliar Anthracnose		Stem Anthracnose		White Mould	
	SGL	DBL	SGL	DBL	SGL	DBL
Incidence	No anthracnose or white mould present					
Severity						

ǂ SGL=single application; Foliar anthracnose 0-9 rating scale, stem anthracnose (presence/absence), white mould 0 – 5 rating scale; bacterial blight present throughout the trial.

Yield by Treatment



Overall Yield & Economics

	Mean (lbs/ac)	Costǂ	Change in Profit/acǂǂ
Double Application	1709	$34/ac	-$17/ac
Single Application	1623	$17/ac	
Yield Difference	86		
P-Value	0.4865		
CV	11%		
Significance	**No**	**Economic**	**No**

ǂ Estimated cost; cost represents product only, does not include application cost

ǂǂ Because yields were not significantly different, there is no increased income to offset the cost of the fungicide. Profit/ac declines by the cost of the fungicide application.

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Dry Bean Nitrogen Fertility Trial

Objective: Quantify the agronomic and economic impacts of nitrogen fertilizer rates in dry beans.

Summary: At the pinto bean trial, there was a significant increase in yield at the highest N rate.

Summary of 2021 dry bean nitrogen fertility trial yield results by site-year.

Trial ID	Rural Municipality	Bean Class	Placement	Seeding Date	Yield			CV	P-Value	Statistically Significant @ 95%
					70 lb N/ac	35 lb N/ac	0 lb N/ac			
					bu/ac			%		
DBN01	Norfolk Treherne	Pinto	Broadcast/Incorporate	Jun 1	1211 A	1089 AB	1060 B	8.1	0.0383	**Yes**

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Dry Bean Nitrogen Fertility Trial

Trial ID: 2021-DBN01 – R.M. of Norfolk Treherne

Objective: Quantify the agronomic and economic impacts of nitrogen fertilizer rates in dry beans

Summary: Nodulation declined as nitrogen rate increased. Nitrate in the top 12" was fairly stable over the season, indicating there may have been limited contribution of mineralized-N to dry bean nutrition this season. The 70 lbs N/ac treatment yielded significantly more than the 0 N control, and this increased profit/ac by more than $20. Yield of the 35 lbs N/ac treatment was similar to the yields of both the 0 N control and the 70 lbs N/ac treatment.

Trial Information

Treatment	0 vs. 35 vs. 70 lbs N/ac
Soil Texture	Clay
Previous Crop	Corn
Tillage	Conventional
Spring Soil N(0-24")ǂ	70 lbs/ac
Seeding Date	June 1
Variety	Vibrant
Seeding Rate	76 500 seeds/ac
Row Spacing	20"
Plant Stand @ V2	59 000 plants/ac
Harvest Date	September 10

ǂCollected as a composite from 0 N strips shortly after planting

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	75.5	93.3	5.2	94.4	268.4
Normal	58	77.1	76.5	58.7	270.3
% Normal	130%	121%	7%	161%	99%

Nodulationǂ

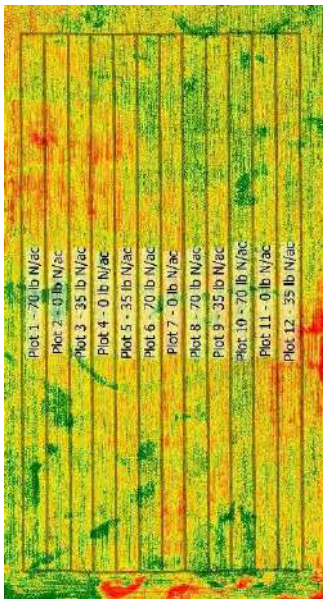
	Average Nodulation Rating @R2ǂ
0 lb N/ac	4.0
35 lb N/ac	3.7
70 lb N/ac	2.9

ǂ 0 = no nodules, 1 = Poor (<5/plant), 2 = Fair (<10/plant), 3 = Good (<20/plant), 4 = Excellent (>20/plant)

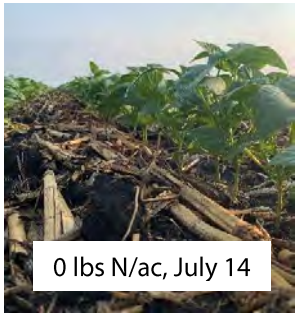
Fall Soil Test N

Treatment	0-24" Fall Nitrate
0 lbs N/ac	39 lbs/ac
35 lbs N/ac	66 lbs/ac
70 lbs N/ac	64 lbs/ac

Field NDVI Image July 12 (Left) & Aug 13 (Right)



Visual Observations



0 lbs N/ac, July 14

70 lbs N/ac, July 14

At late vegetative stages, for a period of ~10 days, the 0 N check strips were paler green than the strips that received N.

At the onset of reproductive growth, there were distinct differences in growth and vigour between pinto beans in the 0 N and 70 lbs N/ac treatments (pictured left).

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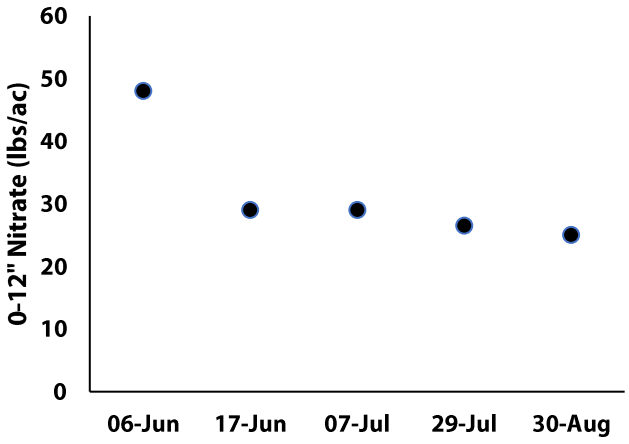
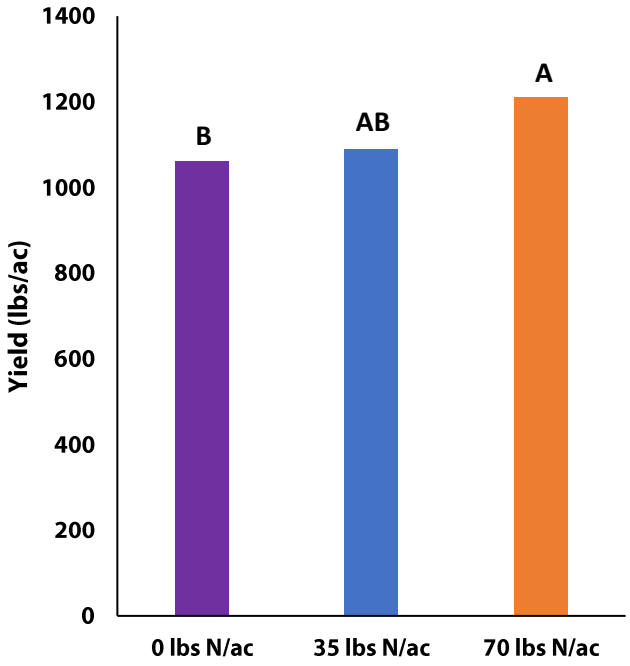
Nitrate Microplot Results

To assess nitrate dynamics through the season, we established microplots in the 0 N strips. Soil samples were collected to a depth of 12", to investigate whether significant mineralization (and associated spikes in soil nitrate) occurred through the season. After an initial decline, nitrate in the top 12" remained stable throughout the growing season, indicating mineralization was likely not a substantial contributor of N at this trial, this season.



Yield by Treatment



Overall Yield & Economics

		Cost†		Change in Profit/ac††	
	Mean (lbs/ac)	Long-Term Average	Current Conditions	Long-Term Average ($0.30-0.40/lb)	Current Conditions ($0.40-0.60/lb)
0 lbs N/ac	1060				
35 lbs N/ac	1089	$10/ac	$18/ac		
70 lbs N/ac	1211	$21/ac	$37/ac	0 lbs N/ac → 70 lbs N/ac: $25 to $40/ac	0 lbs N/ac → 70 lbs N/ac: $24 to $54/ac
P-Value	0.0383				
CV	8.1%				
Significance	**Yes**	**Economic**		**Yes**	**Yes**

† Based on estimated urea cost of $650/MT (long-term average) and $1150 (current conditions)

†† Profit is the difference between the change in income/ac, from a significant yield difference, and the change in cost/ac with for the increase in N rate. Profit/ac is presented as a range across long-term average dry bean prices, and those more similar to current market conditions.

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Dry Bean Tillage Trials

Objective: Quantify the agronomic and economic impacts of strip-till vs. conventional till systems for dry bean production.

Summary: There was a significant yield difference between strip-tilled and conventional tilled dry beans. The pinto bean trial was not harvestable due to conventional till plots remaining green and immature.

Summary of 2021 dry bean tillage trial yield results by site-year.

Trial ID	Rural Municipality	Bean Class	Yield		Yield Difference	CV	P-Value	Statistically Significant @ 95%
			Strip-till	Conventional till				
			---------- lb/ac ----------		lb/ac	%		
DBT01	Roland	Pinto	1376	Not Harvestable	1376	n/a	n/a	**n/a**
DBT02	Dufferin	Black Bean	1894	1605	289	11	0.0048	**Yes**

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Dry Bean Tillage Trial

Trial ID: 2021-DBT01 – R.M. of Roland

Objective: Quantify the agronomic and economic impacts of strip-till vs. conventional till systems for dry bean production

Summary: The conventional tilled strips could not be harvested as they did not mature or dry down. As a result, yield for the conventional tilled strips is effectively zero, and strip till was an economically beneficial production decision.

Trial Information†

Treatment	Conventional vs. Strip Tillage
Rural Municipality	Roland
Soil Texture	Clay
Previous Crop	Wheat
Seeding Date	May 18
Variety	SV6139R
Seeding Rate	71 000 seeds/ac
Row Spacing	30"
Plant Stand @ V2	69 000 plants/ac
Harvest Date	September 22

† A 80-50-0-10 fertilizer blend was banded 6" below the seed in the strip-till treatment and broadcast/incorporated in the conventional till treatment

Precipitation (mm)

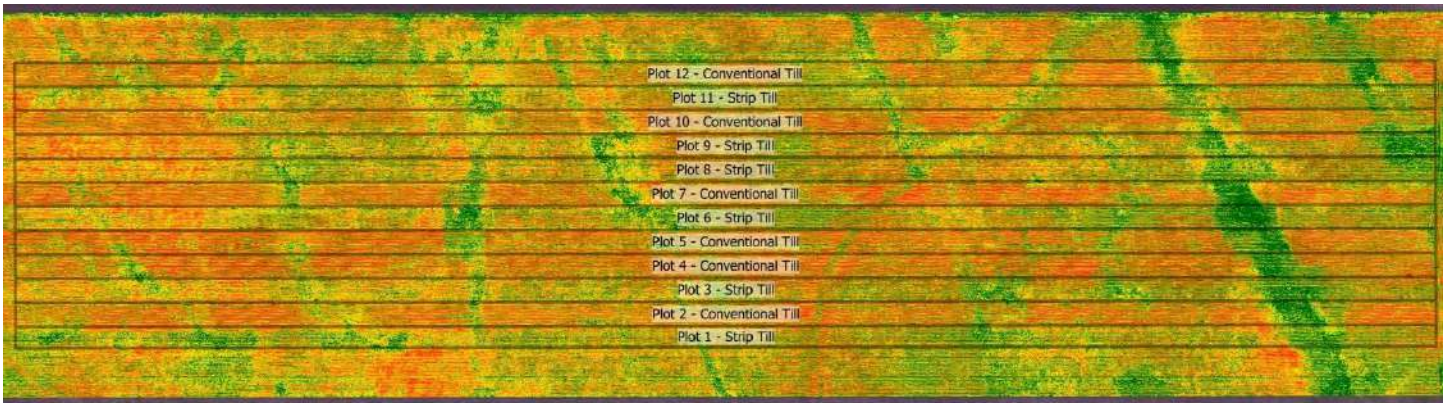
	May	Jun	Jul	Aug	Total
Rainfall	29	104	17.9	77.7	228.8
Normal	53.8	80.6	65.7	71	271.1
% Normal	54%	129%	27%	109%	84%

Visual Observations

Beginning at the transition between vegetative and reproductive growth stages, and persisting until harvest, the strip-till beans were much more vigorous.

At maturity, the conventional till beans had not dried down and could not be harvested (pictured left).

NDVI Field Image Aug 13



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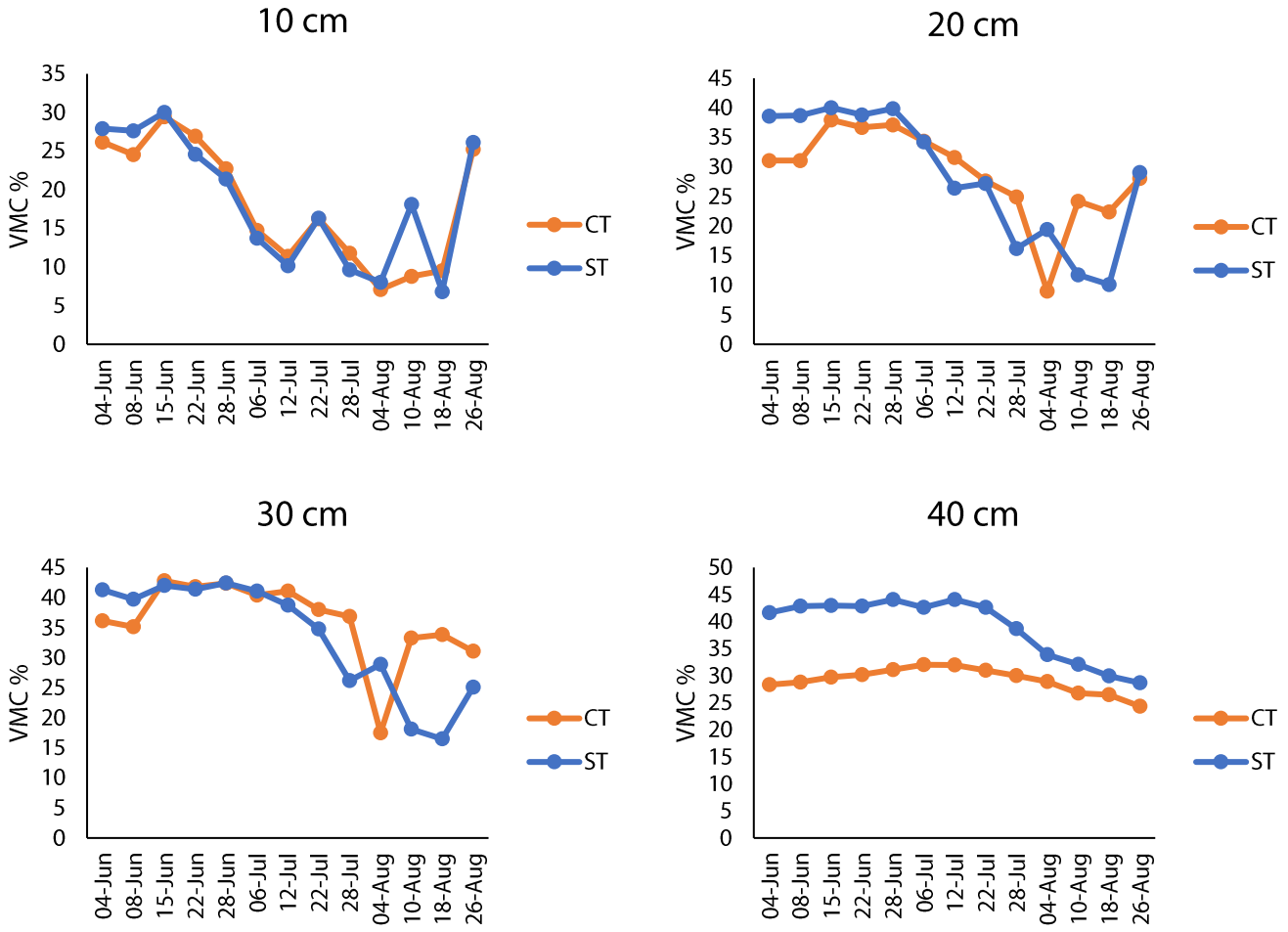
Volumetric Soil Moisture Content (%) by Soil Depth



Overall Yield & Economics

	Mean (lbs/ac)	Total Costs ǂ	Change in Profit/ac ǂǂ	
			Long-Term Average ($0.30-0.40/lb)	Current Conditions ($0.40-0.60/lb)
Strip-Till	1376	$13/ac	$393 to $530/ac	$550 to $826/ac
Conventional Till	***Not harvestable***	$33/ac		
Yield Difference	1376			
P-Value	n/a			
CV	n/a			
Significance	n/a	**Economic**	**Yes**	**Yes**

ǂ Based on fuel, labour and operating cost totals for each tillage system

ǂǂ Profit is the difference between the change in income/ac and the change in cost/ac between the tillage systems. Profit/ac is presented as a range across long-term average dry bean prices, and those more similar to current market conditions.

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Dry Bean Tillage Trial

Trial ID: 2021-DBT02 – R.M. of Dufferin

Objective: Quantify the agronomic and economic impacts of strip-till vs. conventional till systems for dry bean production

Summary: There was a significant yield difference between tillage systems, with strip-till yielding 289 lbs/ac more than conventional till. Strip-till was an economically favourable decision at this field, this season.

Trial Information†

Treatment	Conventional vs. Strip Tillage
Rural Municipality	Dufferin
Soil Texture	Clay
Previous Crop	Wheat
Seeding Date	May 28
Variety	Eclipse
Seeding Rate	108 000 seeds/ac
Row Spacing	30"
Plant Stand @ V2	100 000 plants/ac
Harvest Date	September 24

†A 15% reduction in fertilizer rate was applied in strip-till strips, to account for increased efficiency of band vs. broadcast and incorporated placement.

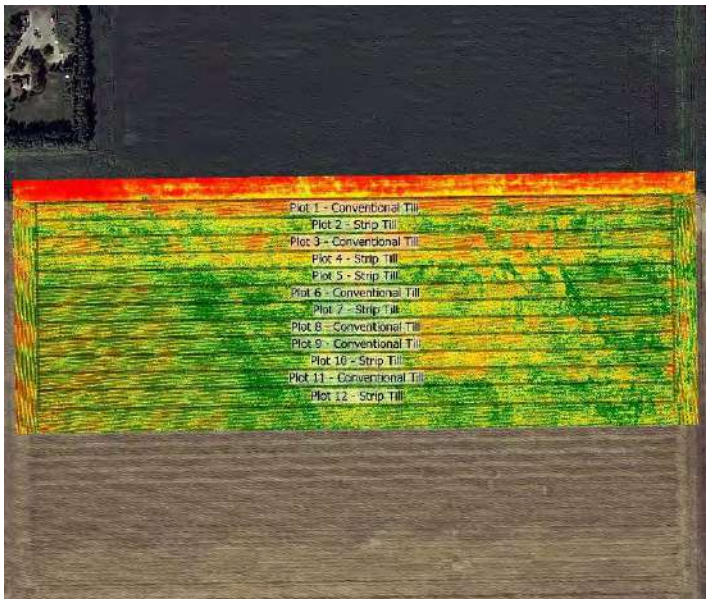
Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	29	104	17.9	77.7	228.8
Normal	53.8	80.6	65.7	71	271.1
% Normal	54%	129%	27%	109%	84%

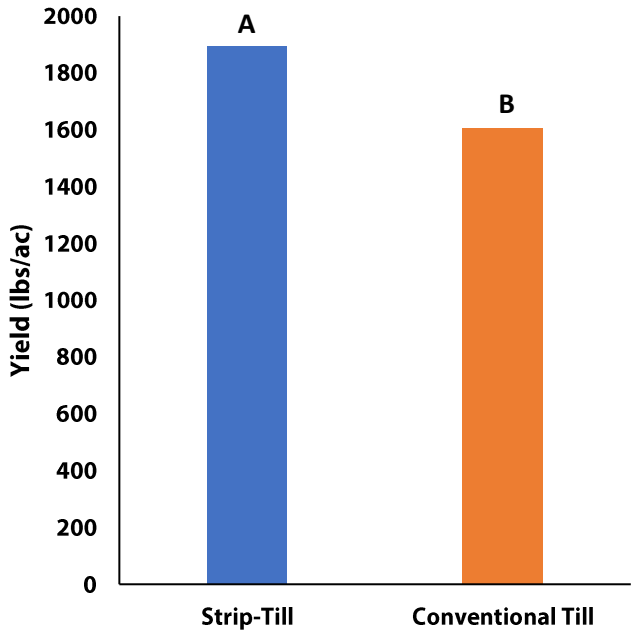
In-Season Observations

Beginning at the transition between vegetative and reproductive growth stages, strip-till beans (bottom image) looked more vigorous compared to conventional till beans (top image). Differences were subtle, but evident until maturity.

NDVI Field Image August 16



Yield by Treatment



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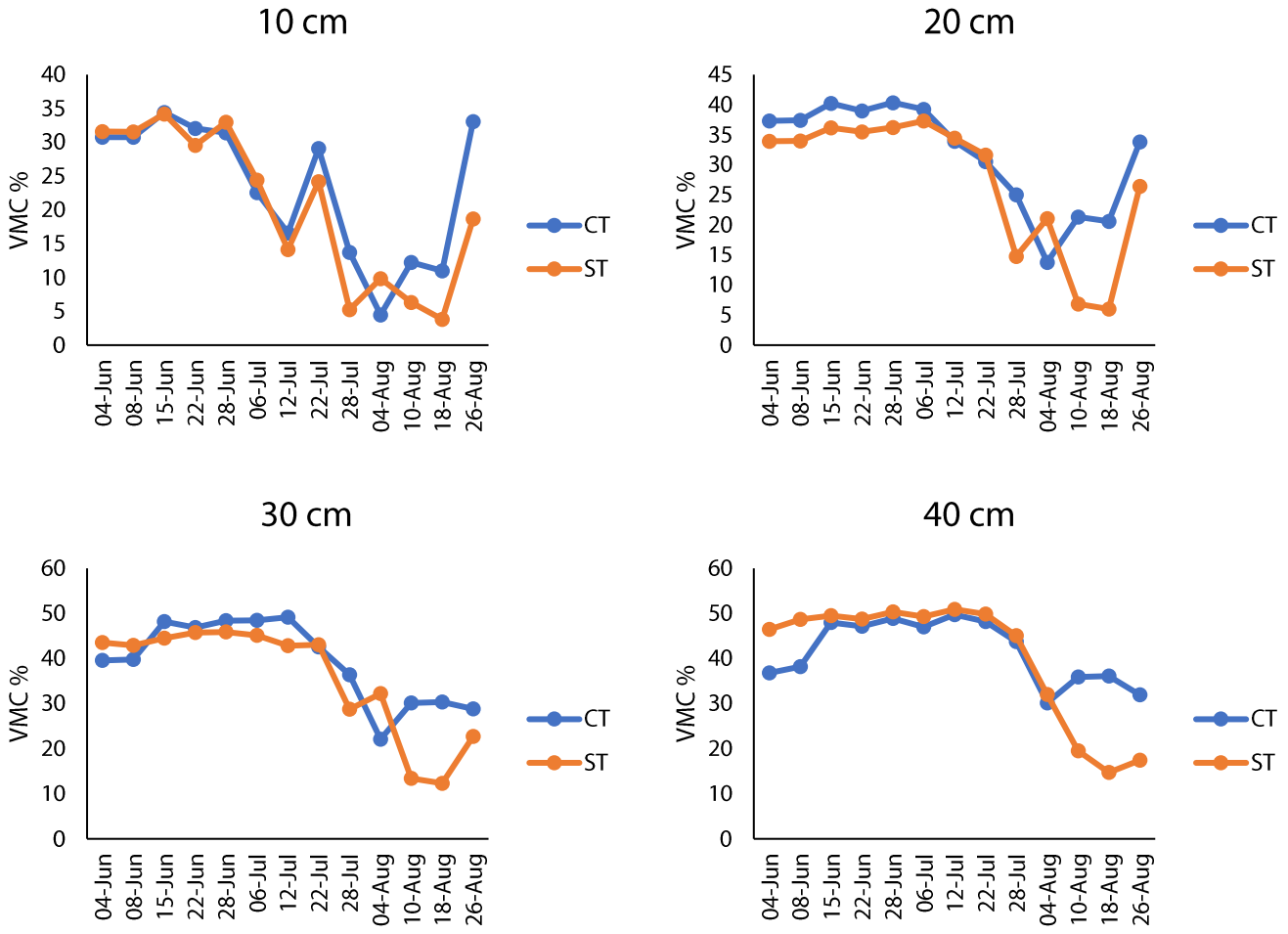
Volumetric Soil Moisture Content (%) by Soil Depth



Overall Yield & Economics

	Mean (lbs/ac)	Total Cost†	Change in Profit/ac††	
			Long-Term Average ($0.30-0.40/lb)	Current Conditions ($0.40-0.60/lb)
Strip-Till	1894	$88/ac	$66 to $95/ac	$116 to $173/ac
Conventional Till	1605	$109/ac		
Yield Difference	289			
P-Value	0.0048			
CV	11%			
Significance	**Yes**	**Economic**	**Yes**	**Yes**

† Based on fertilizer, application, fuel and operating costs for the two tillage systems

†† Profit is the difference between the change in income/ac, from a significant yield difference, and the change in cost/ac between the tillage systems. Profit is presented as a range across long-term average dry bean prices, and those more similar to current market conditions.

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NOTES

Faba Bean Fungicide Trials

Objective: Quantify the agronomic and economic impacts of a single foliar fungicide application in faba beans.

Summary: There was no significant difference in a single application of fungicide compared to a double application of fungicide.

Summary of 2021 faba bean foliar fungicide trial yield results by site-year.

Trial ID	Rural Municipality	Product	Row Spacing	Plant Stand Midseason	Yield		Yield Difference	CV	P-Value	Statistically Significant @ 95%
					Single App	Double App				
			inch	'000/ac	bu/ac		bu/ac	%		
FF01	Riding Mountain	Zolera ODX	10	137k	20	19.7	-0.3	7.6	0.8933	**No**
FF03	Swan Valley West	Dyax	10	166k	41.2	41.9	0.7	8.2	0.5751	**No**

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Faba Bean Fungicide Trial

Trial ID: 2021-FF01 – R.M. of Riding Mountain

Objective: Quantify the agronomic and economic impacts of a double vs. single foliar fungicide application in faba beans

Summary: Foliar ascochyta and chocolate spot were prevalent throughout the trial at low to moderate severity. However, yield did not significantly differ between faba beans with a single vs. double application of Zolera ODX. As a results, profit/ac decreased by the cost increase of the double fungicide application.

Trial Information

Treatment	Zolera ODX (Single vs. Double)
Application Timing	Early flower / Full flower
Application Date	July 1 / July 16
Application Rate	230 ml/ac
Application Method	Broadcast
Soil Texture	Clay Loam
Previous Crop	Canola
Tillage	Conventional
Seeding Date	May 8
Variety	Navi
Seeding Rate	4 bu/ac
Row Spacing	10″
Plant Stand @ R4	137 000 plants/ac
Harvest Date	October 6

Precipitation (mm)

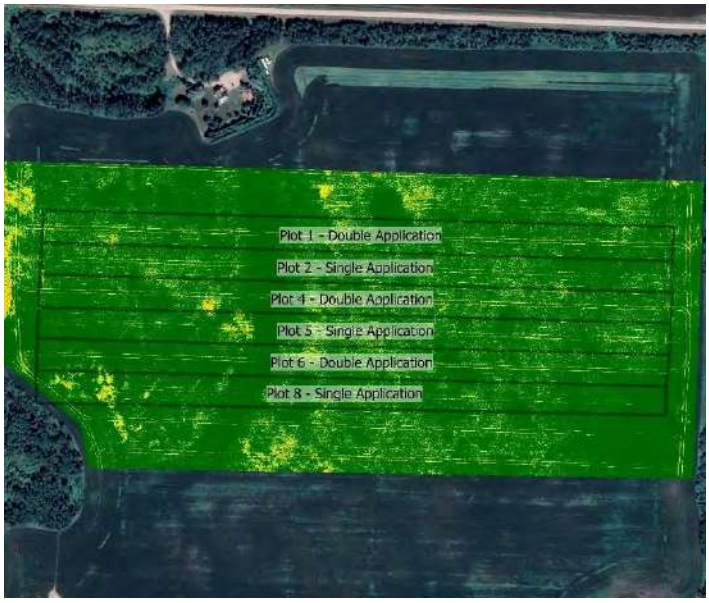
	May	Jun	Jul	Aug	Total
Rainfall	33.3	111	28.4	126	298
Normal	50.1	78.2	71.6	68	267.9
% Normal	66%	141%	40%	185%	111%

Summary of Disease Rating (R4) ǂ

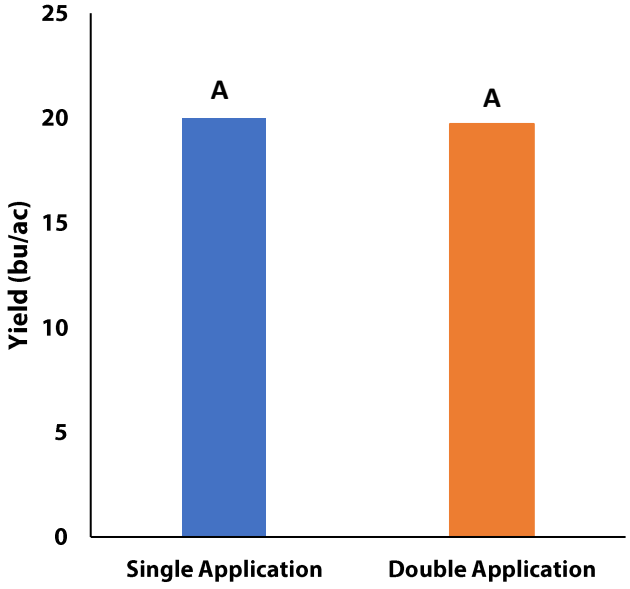
	Foliar Ascochtya		Chocolate Spot/Stemphylium	
	SGL	DBL	SGL	DBL
Incidence	68%	58%	95%	100%
Severity	1.9	1.6	2.1	2.4

ǂ SGL=Single application; Foliar ascochyta 1 – 7 rating scale, chocolate spot/stemphylium 1 – 5 rating scale

NDVI Field Image July 21



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Double Application	19.7	$34/ac	-$17/ac
Single Application	20.0	$17/ac	
Yield Difference	-0.3		
P-Value	0.8933		
CV	7.6%		
Significance	**No**	**Economic**	**No**

† Based on estimated cost for faba bean fungicide; product only, does not include cost of application

†† Because yields were not significantly different, there is no increased income to offset the increased cost of the double application. Profit/ac declines by this increased cost as a result.

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Faba Bean Fungicide Trial

Trial ID: 2021-FF03 – R.M. of Swan Valley West

Objective: Quantify the agronomic and economic impacts of a double vs. single foliar fungicide application in faba beans

Summary: Foliar ascochyta and chocolate spot were prevalent throughout the trial, at relatively low severity. There was no significant yield difference between faba beans with a single vs. double application of Dyax. As a result, profit/ac decreased by the increased cost of the double fungicide application.

Trial Information

Treatment	Dyax (Single vs Double)
Application Timing	Early flower/late flower
Application Date	July 1 / July 13
Application Rate	0.4 L/ha / 0.4 L/ha
Application Method	Broadcast
Soil Texture	Clay
Previous Crop	Canola
Tillage	Conventional
Seeding Date	April 29
Variety	Snowbird
Seeding Rate	240 lbs/ac
Row Spacing	10"
Plant Stand @ R5	166 000 plants/ac
Harvest Date	September 22

Precipitation (mm)

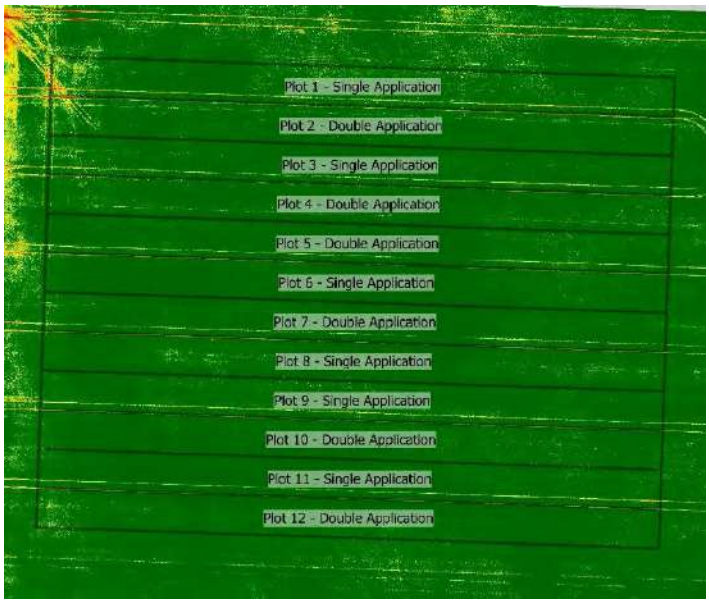
	May	Jun	Jul	Aug	Total
Rainfall	38.5	64.1	56.8	73.7	233.1
Normal	45.4	84.2	85.6	68.3	283.5
% Normal	85%	76%	66%	108%	82%

Summary of Disease Rating (R5)ǂ

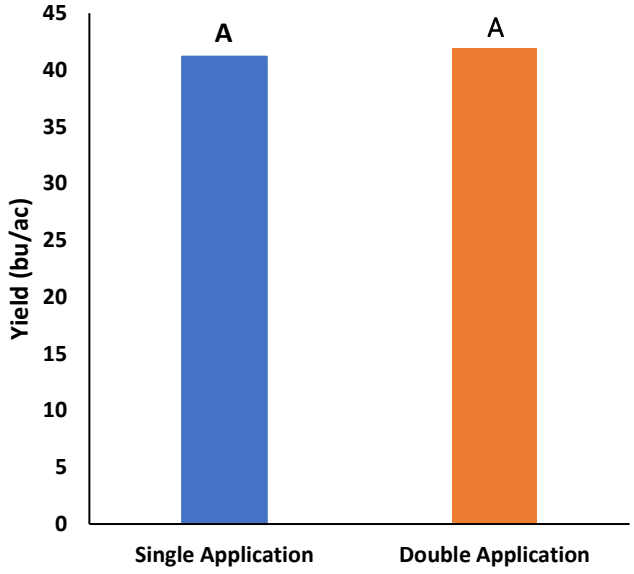
	Foliar Ascochtya		Chocolate Spot/Stemphylium	
	SGL	DBL	SGL	DBL
Incidence	82%	73%	55%	57%
Severity	2.1	1.9	1.6	1.6

ǂ SGL=Single application; Foliar ascochyta 1 – 7 rating scale, chocolate spot/stemphylium 1 – 5 rating scale

NDVI Field Image July 28



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Double Application	41.9	$34/ac	-$17/ac
Single Application	41.2	$17/ac	
Yield Difference	0.7		
P-Value	0.5751		
CV	8.2%		
Significance	**No**	**Economic**	**No**

† Based on estimated cost for faba bean fungicide; product only, does not include cost of application

†† Because yields were not significantly different, there is no increased income to offset the increased cost of the double application. Profit/ac declines by this increased cost as a result.

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NOTES

Pea Single Inoculant Trial

Objective: Quantify the agronomic and economic impacts of granular inoculant rates for field peas.

Summary: There was no significant yield difference between 1x and 2x rates.

Summary of 2021 pea single inoculant trial yield results by site-year.

Trial ID	Rural Municipality	Seeding Date	Nodule Rating @ R2 (0-5 scale)		Yield		Yield Difference	CV	P-Value	Statistically Significant @ 95%
			1x Rate	2x Rate	1x Rate	2x Rate				
					bu/ac		bu/ac	%		
P1IN01	Grassland	May 8	4.3	4.7	51.8	49.0	-2.8	9.3	0.1873	**No**

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Pea Inoculant Rate Trial

Trial ID: 2021-P1IN01 – R.M. of Grassland

Objective: Quantify the agronomic and economic impacts of granular inoculant rates for field peas.

Summary: Nodulation ratings were very similar between treatments, and agronomically sufficient. There was no significant yield difference between rates of inoculant. Due to the lack of yield response, there was a decrease in profit/ac in the 2x rate area of the trial, equivalent to the cost of increased inoculant rate.

Trial Information

Treatment	Nodulator Granular 3.2 vs 6.4 lbs/ac
Last Pea Crop	2009
Soil Texture	Loam
Previous Crop	Wheat
Tillage	Conventional
Seeding Date	May 8
Variety	AAC Carver
Seeding Rate	180 lbs/ac
Row Spacing	12"
Plant Stand @ V4	216 000 plants/ac
Harvest Date	August 8

Precipitation (mm)

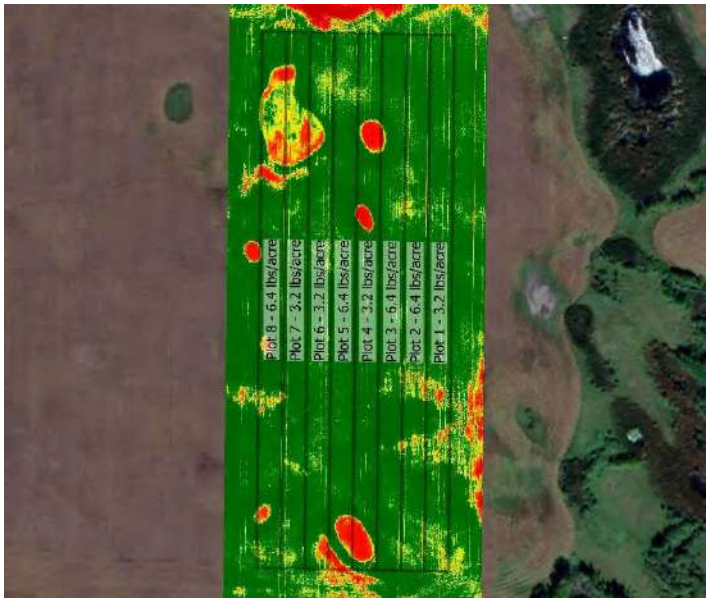
	May	Jun	Jul	Aug	Total
Rainfall	28.1	89.9	22.3	103	243.4
Normal	61.1	89.8	68.3	72.3	291.5
% Normal	46%	100%	33%	143%	83%

Nodulation†

	Average Nodulation Rating @ R2
1x Rate	4.3
2x Rate	4.7

† 0 = no nodules OR nodules with green/white colour, 1 = <3 clusters of nodules, 3 = 3-5 clusters of predominantly pink nodules, 5 = >5 clusters of pink nodules

NDVI Field Image July 12



Nodulation Observations

Nodulation was excellent in most areas of the trial, at R2. As indicated by the average nodulation ratings by treatment, nodulation was very similar between inoculant rate treatments.

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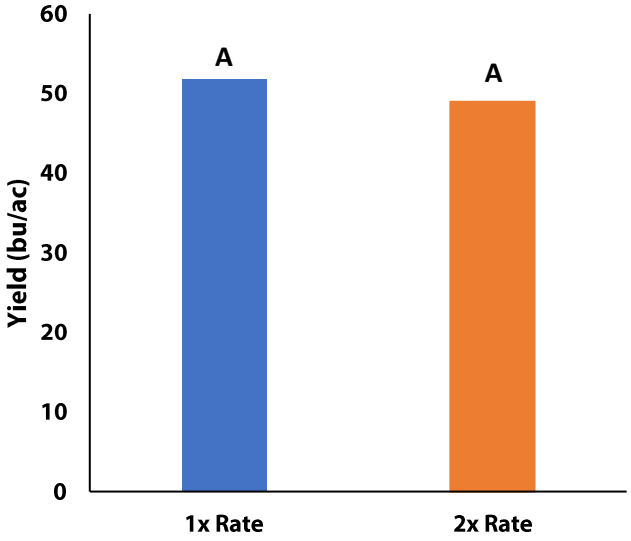
Yield by Treatment



Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
2x Rate	49.0	$20/ac	-$10/ac
1x Rate	51.8	$10/ac	
Yield Difference	-2.8		
P-Value	0.1873		
CV	9.3%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for granular in-furrow inoculant

†† Because yields were not significantly different, there is no increased income with the 2x rate to offset the increase in price. Profit/ac decreases by the increased price as a result.

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NOTES

Pea Double Inoculant Trial

Objective: Quantify the agronomic and economic impacts of double vs. single inoculating field peas.

Summary: There was no significant yield difference between single and double inoculant.

Summary of 2021 pea double inoculant trial yield results by site-year.

Trial ID	Rural Municipality	Seeding Date	Nodule Rating @ R2 (0-5 scale)		Yield		Yield Difference	CV	P-Value	Statistically Significant @ 95%
			Double	Single	Double	Single				
			bu/ac				bu/ac	%		
P2IN01	Sifton	Apr 29	3.8	3.7	33.6	34.2	-0.6	34	0.8458	**No**

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Pea Double Inoculant Trial

Trial ID: 2021-P2IN01 – R.M. of Sifton

Objective: Quantify the agronomic and economic impacts of double vs. single inoculating field peas.

Summary: Nodulation ratings were very similar between treatments and indicated nodulation was sufficient for peas that were single inoculated, and those that were double inoculated. There was no significant yield difference between inoculant treatments. Due to the lack of yield response with granular inoculant in addition to on-seed inoculant, there was a decrease in profit/ac, equivalent to the cost of the in-furrow inoculant application.

Trial Information

Treatment	Liquid On-Seed vs. Liquid On-Seed with 1x Granular
Last Pea Crop	No Previous Pea Crop
Pea History	No Pea History
Soil Texture	Loamy Sand
Previous Crop	Canola
Tillage	Conventional
Seeding Date	April 29
Variety	AAC Chrome
Seeding Rate	180 lbs/ac
Row Spacing	10"
Plant Stand @ V4	182 000 plants/ac
Harvest Date	August 5

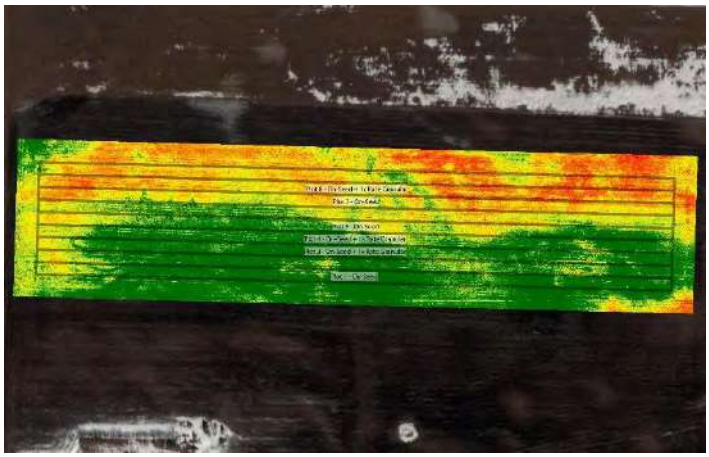
Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	23.3	88.7	34.4	135	281.6
Normal	48	75.6	64.5	57.8	245.9
% Normal	49%	117%	53%	234%	115%

Early season Nodulation Observations

Nodulation was developing well early in the season. Image (left) captured on June 1, 2021, when the peas were at V3-4.

NDVI & RGB Field Images July 12



Nodulation†

	Average Nodulation Rating @ R2
Double	3.8
Single	3.7

† 0 = no nodules or nodules with green/white colour, 1 = <3 clusters of nodules, 3 = 3-5 clusters of predominantly pink nodules, 5 = >5 clusters of pink nodules

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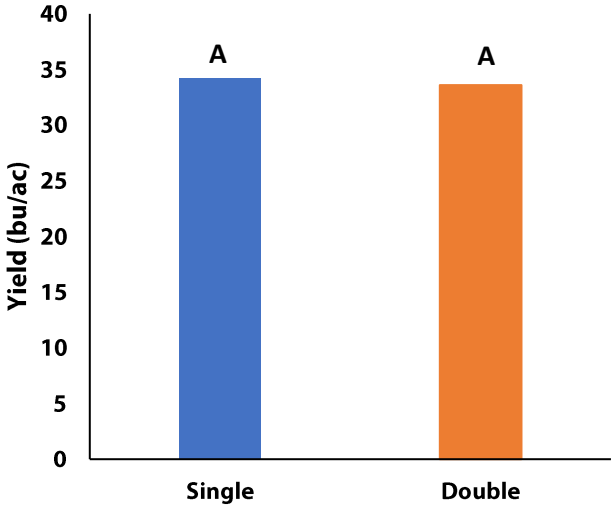
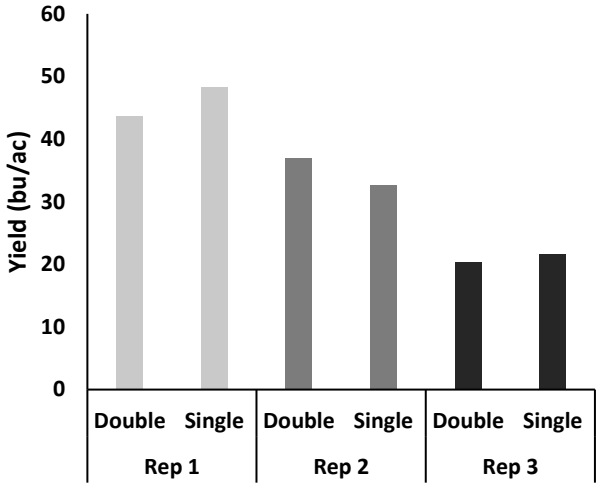
Yield by Treatment



Yield by Rep



Yield by rep is not useful for determining overall treatment effects. However, in this case where we have high variability across the trial (as seen in the NDVI image above), yield by rep is informative to determine whether data should be included or excluded from over treatment comparisons. In this case, yields from strips within reps are quite similar, and the majority of the variability is across replicates, rather than treatment strips within replicates. Thus, we determined yield data for all strips could be included in the overall analysis of treatment effects.

Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Double Inoculant	33.6	$13/ac	-$10/ac
Single Inoculant	34.2	$3/ac	
P-Value	0.8458		
CV	34%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for on-seed + granular in-furrow vs. on-seed only

†† Because yields were not significantly different, there is no increased income with the double inoculant to offset the increase in price. Profit/ac decreases by the increased cost as a result.

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NOTES

Pea Foliar Fungicide Trials

Objective: Quantify the agronomic and economic impacts of a single and double foliar fungicide application in field peas.

Summary: For single vs. no application trials as well as double vs. single application trials, there was no significant yield difference between treatments.

Summary of 2021 field pea foliar fungicide trial yield results by site-year.

Trial ID	Rural Municipality	Product	Yield		Yield Difference	CV	P-Value	Statistically Significant @ 95%
			Single App	Untreated				
			---------- bu/ac ----------		bu/ac	%		
PF01	Roland	Cotegra	33.8	34.5	-0.7	3.6	0.5087	**No**
PF03	Dauphin	Cotegra	42.4	43.4	-1.0	26.0	0.7571	**No**
PF04	Dauphin	Cotegra	59.4	60.7	-1.3	5.7	0.3706	**No**

Trial ID	Rural Municipality	Product	Yield		Yield Difference	CV	P-Value	Statistically Significant @ 95%
			Double app	Single App				
			---------- bu/ac ----------		bu/ac	%		
PF09	Swan Valley West	Delaro / Zolera	40.3	39.3	1	7.4	0.3557	**No**

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Pea Fungicide Trial

Trial ID: 2021-PF01 – R.M. of Roland

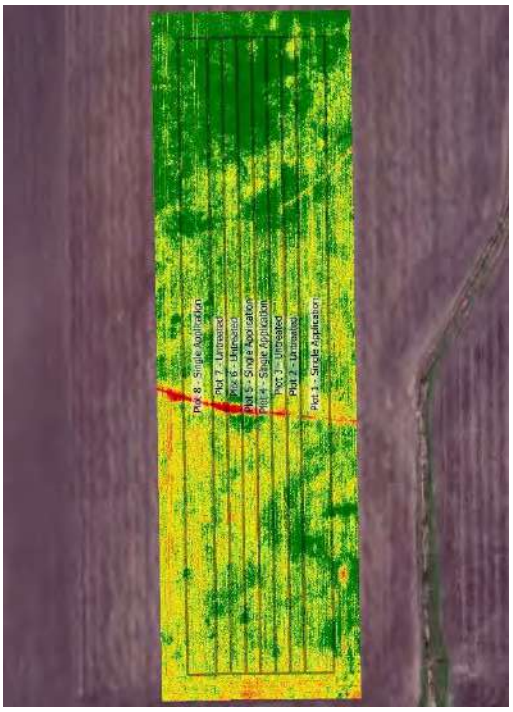
Objective: Quantify the agronomic and economic impacts of a single foliar fungicide application in field peas

Summary: The pre-spray check (R1) did not indicate an application of fungicide was necessary. No foliar or stem ascochyta and no white mould symptoms were observed after fungicide application, at R3. There was no significant yield difference between peas with and without a single application of Cotegra. As a result, profit/ac in the treated area of the trial decreased by the cost of fungicide application.

Trial Information

Treatment	Cotegra
Application Timing	Early Flower
Application Date	June 26
Application Rate	280 ml/ac
Application Method	Broadcast
Soil Texture	Clay, Fine Sandy Loam
Previous Crop	Dry Beans
Tillage	Zero Till
Seeding Date	April 27
Variety	CDC Lewochko
Seeding Rate	180 lbs/ac
Row Spacing	10"
Plant Stand @ R3	221 000 plants/ac
Harvest Date	August 2

NDVI Field Image July 13



Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	29	104	17.9	77.7	228.8
Normal	53.8	80.6	65.7	71	271.1
% Normal	54%	129%	27%	109%	84%

Results from the Pre-Spray Check (R1)

Category	Average Rating†	Explanation
Crop Canopy	15	Normal (~8 plants/ft^2)
Leaf Wetness/Humidity @ 12 pm	0	No leaf wetness
5-Day Weather Forecast	10	Unpredictable
Ascochyta Symptoms on Peas	0	No visible symptoms
Total Score	**25**	**No application recommended**

† Ratings taken at six locations in the field and average together to assess overall field risk

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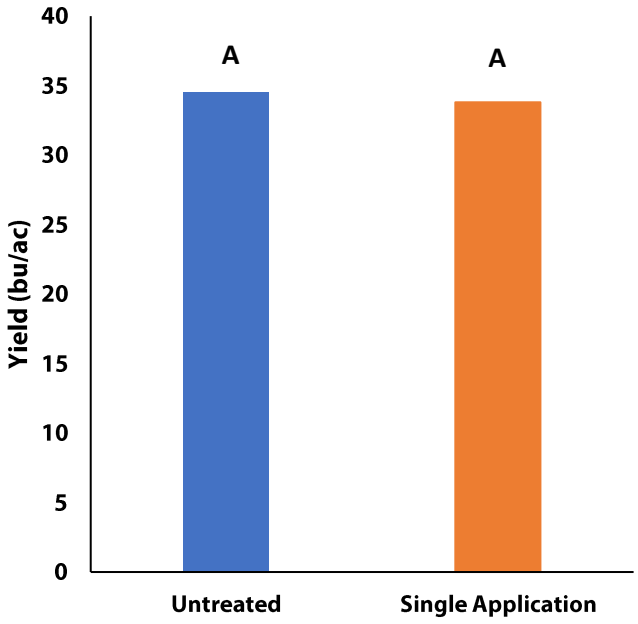
Summary of Disease Rating (R3)ǂ

	Foliar Ascochtya		White Mould	
	UN	SGL	UN	SGL
Incidence	0%	0%	0%	3%
Severity	0.0	0.0	0.0	0.0

ǂ SGL=Single application; Foliar ascochyta
1 – 7 rating scale, stem ascochyta 1-7 rating scale

Yield by Treatment



Observations (R3)

No foliar disease symptoms were observed at R1 during the pre-spray check, or post-fungicide application at R3, during disease rating (pictured left).

Overall Yield & Economics

	Mean (bu/ac)	Costǂ	Change in Profit/acǂǂ
Single Application	33.8	$17/ac	-$17/ac
Untreated	34.5		
Yield Difference	-0.7		
P-Value	0.5087		
CV	3.6%		
Significance	**No**	**Economic**	**No**

ǂ Estimated cost; represents product only, does not include application cost
ǂǂ Because yields were not significantly different, there is no increased income to offset the cost of the fungicide. Profit/ac declines by the cost of the fungicide application.

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Pea Fungicide Trial

Trial ID: 2021-PF03 – R.M. of Dauphin

Objective: Quantify the agronomic and economic impacts of a single foliar fungicide application in field peas

Summary: The pre-spray check (R1) did not indicate an application of fungicide was necessary. Foliar ascochyta was prevalent throughout the trial, at relatively low severity, post-fungicide application, at R3. There was no significant yield difference between peas with and without a single application of Cotegra. As a result, profit/ac in the treated area of the trial decreased by the cost of the fungicide application.

Trial Information

Treatment	Cotegra
Application Timing	Early Flower
Application Date	June 30
Application Rate	280 ml/ac
Application Method	Broadcast
Soil Texture	Loamy Fine Sand
Previous Crop	Wheat
Tillage	Conventional
Seeding Date	May 1
Variety	CDC Inca
Seeding Rate	168 lbs/ac
Row Spacing	10"
Plant Stand @ R4	204 000 plants/ac
Harvest Date	August 8

NDVI Field Image July 9

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	34.6	74.1	74.1	128	310.6
Normal	51.8	81.9	76.7	71.6	282
% Normal	67%	90%	97%	178%	110%

Results from the Pre-Spray Check (R1)

Category	Average Rating[ǂ]	Explanation
Crop Canopy	15	Normal (~8 plants/ft^2)
Leaf Wetness/Humidity @ 12 pm	0	No leaf wetness
5-Day Weather Forecast	10	Unpredictable
Ascochyta Symptoms on Peas	3.3	Less than 20% of plants showing symptoms
Total Score	**28.3**	**No application recommended**

ǂ Ratings taken at six locations in the field and average together to assess overall field risk

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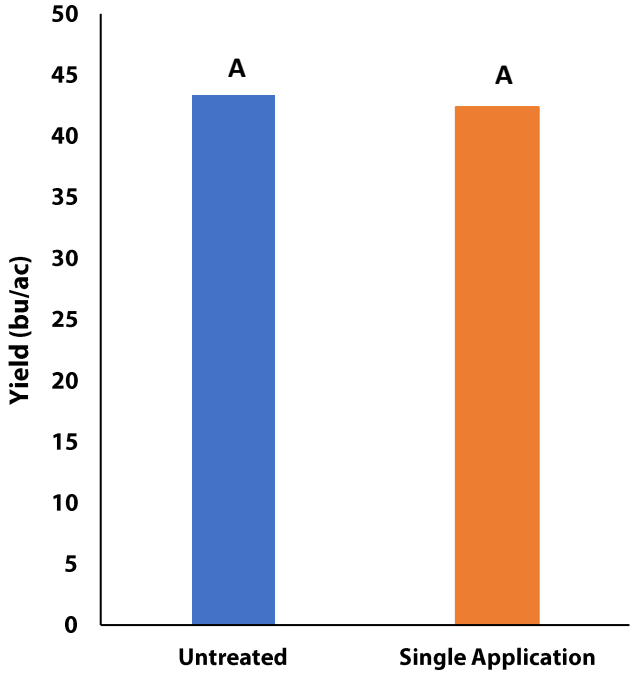
Summary of Disease Rating (R3)†

	Foliar Ascochtya		White Mould	
	UN	SGL	UN	SGL
Incidence	90%	95%	0%	3%
Severity	2.0	1.8	0.0	0.0

† SGL=Single application; Foliar ascochyta 1 – 7 rating scale, white mould 0-5 rating scale

Yield by Treatment



Observations (R3)

Foliar ascochyta was present throughout the trial at relatively low severity.

Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Single Application	42.4	$17/ac	-$17/ac
Untreated	43.4		
Yield Difference	-1.0		
P-Value	0.7571		
CV	26%		
Significance	**No**	**Economic**	**No**

† Estimated cost; represents product only, does not include application cost

†† Because yields were not significantly different, there is no increased income to offset the cost of the fungicide. Profit/ac declines by the cost of the fungicide application.

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Pea Fungicide Trial

Trial ID: 2021-PF04 – R.M. of Dauphin

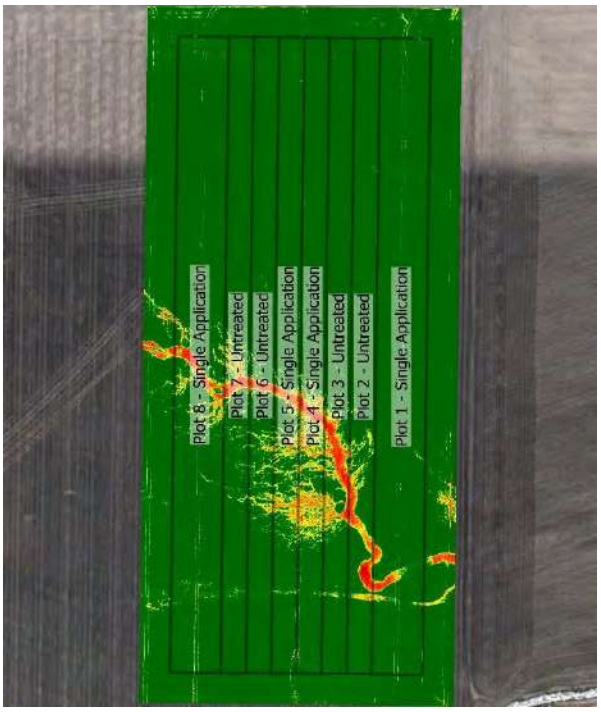
Objective: Quantify the agronomic and economic impacts of a single foliar fungicide application in field peas

Summary: The pre-spray check (V12) did not indicate an application of fungicide was necessary. At R3, our post-fungicide application disease rating indicated that foliar and stem ascochyta were present at very low levels. There was no significant yield difference between peas with and without a single application of Cotegra. As a result, profit/ac in the treated area of the trial decreased by the cost of the fungicide application.

Trial Information

Treatment	Cotegra
Application Timing	Early Flower
Application Date	June 30
Application Rate	280 ml/ac
Application Method	Broadcast
Soil Texture	Clay to Clay Loam
Previous Crop	Wheat
Tillage	Conventional
Seeding Date	May 5
Variety	AAC Carver
Seeding Rate	198 lbs/ac
Row Spacing	10"
Plant Stand @ R4	289 000 plants/ac
Harvest Date	August 6

NDVI Field Image July 9



Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	23.9	70.9	30.3	89.5	214.6
Normal	54.3	86.7	73.2	63.3	277.5
% Normal	44%	82%	41%	141%	77%

Results from the Pre-Spray Check (V12)

Category	Average Rating‡	Explanation
Crop Canopy	20	Normal (~8 plants/ft^2) to dense
Leaf Wetness/Humidity @ 12 pm	0	No leaf wetness
5-Day Weather Forecast	10	Unpredictable
Ascochyta Symptoms on Peas	3.3	Less than 20% of plants showing symptoms
Total Score	**33.3**	**No application recommended**

‡ Ratings taken at six locations in the field and average together to assess overall field risk

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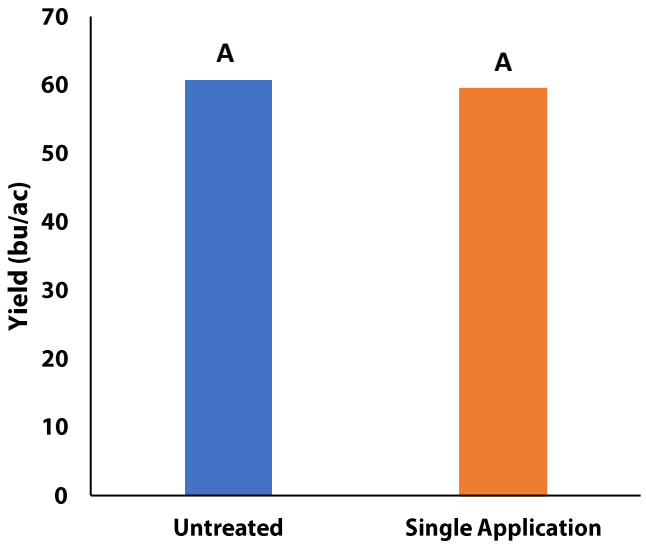
Summary of Disease Rating (R3)†

	Foliar Ascochtya		Stem Ascochyta	
	UN	SGL	UN	SGL
Incidence	3%	0%	3%	0%
Severity	1.0	1.0	1.0	1.0

† SGL=Single application; Foliar ascochyta 1 – 7 rating scale, stem ascochyta 1-7 rating scale

Yield by Treatment



Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Single Application	59.4	$17/ac	-$17/ac
Untreated	60.7		
Yield Difference	-1.3		
P-Value	0.3706		
CV	5.7%		
Significance	**No**	**Economic**	**No**

† Estimated cost; represents product only, does not include application cost

†† Because yields were not significantly different, there is no increased income to offset the cost of the fungicide. Profit/ac declines by the cost of the fungicide application.

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Pea Fungicide Trial

Trial ID: 2021-PF09 – R.M. of Swan Valley West

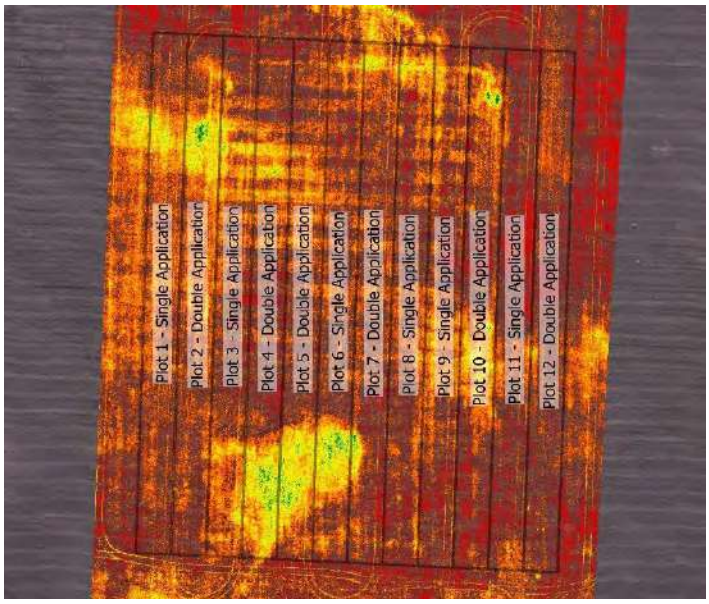
Objective: Quantify the agronomic and economic impacts of a double vs. single foliar fungicide application in field peas

Summary: The pre-spray check did not indicate the need for fungicide application. Foliar ascochyta was prevalent throughout the trial at R3, but at relatively low severity. There was no significant yield difference between peas with a double application, compared to those with a single application. As a result, profit/ac decreased by the increased cost of the double application.

Trial Information

Treatment	Delaro / Zolera
Application Timing	Early flower/Full flower
Application Date	June 28 / July 8
Application Rate	356ml/ac / 550 ml/ha
Application Method	Broadcast
Soil Texture	Very Fine Sandy Loam
Previous Crop	Canola
Tillage	Conventional
Seeding Date	May 5
Variety	Lewochko
Seeding Rate	3.6 bu/ac
Row Spacing	12"
Plant Stand @ R4	247 000 plants/ac
Harvest Date	August 11

NDVI Field Image July 28ǂ



ǂ Imagery captured ~2 weeks later than optimal timing; the crop was quite advanced, leading to the red/yellow colouration of the trial image

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	38.5	64.1	56.8	73.7	233.1
Normal	45.4	84.2	85.6	68.3	283.5
% Normal	85%	76%	66%	108%	82%

Results from the Pre-Spray Check (V10)

Category	Average Ratingǂ	Explanation
Crop Canopy	11.6	Moderate to Normal (~8 plants/ft^2)
Leaf Wetness/Humidity @ 12 pm	0	No leaf wetness
5-Day Weather Forecast	10	Unpredictable
Ascochyta Symptoms on Peas	0	No visible symptoms
Total Score	**21.6**	**No application recommended**

ǂ Ratings taken at six locations in the field and average together to assess overall field risk

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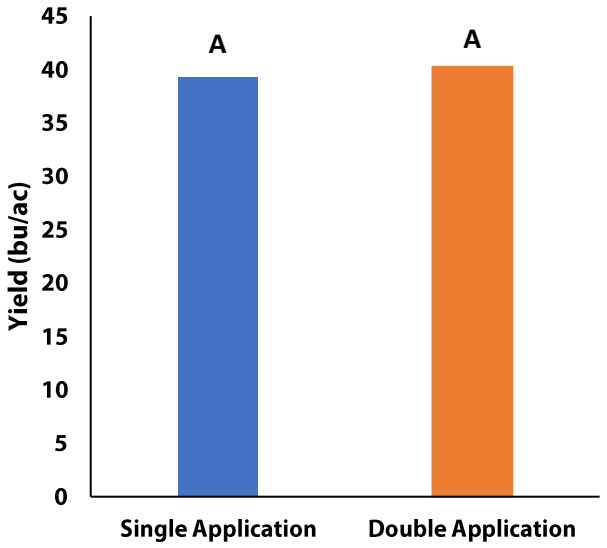
Summary of Disease Rating (R3)ǂ

	Foliar Ascochtya		Stem Ascochyta	
	SGL	DBL	SGL	DBL
Incidence	82%	100%	0%	2%
Severity	1.8	2.3	1.0	1.0

ǂ SGL=Single application, DBL=double application; Foliar ascochyta 1 – 7 rating scale, stem ascochyta 1-7 rating scale

Yield by Treatment



Overall Yield & Economics

	Mean (bu/ac)	Costǂ	Change in Profit/acǂǂ
Double Application	40.3	$34/ac	-$17/ac
Single Application	39.3	$17/ac	
Yield Difference	1.0		
P-Value	0.3557		
CV	7.4%		
Significance	**No**	**Economic**	**No**

ǂ Estimated cost; represents product only, does not include application cost

ǂǂ Because yields were not significantly different, there is no increased income to offset the cost of the second application. Profit/ac declines by the increased cost as a result.

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NOTES

Pea Seeding Rate Trials

Objective: Quantify the agronomic and economic impacts of different pea seeding rates.

Summary: There was no significant yield difference between seeding rates.

Summary of 2021 field pea seeding rate trial yield results by site-year.

Trial ID	Rural Municipality	Row Spacing	Seeding Rate			Plant Stand @ Midseason			Yield			CV	P-Value	Statistically Significant @ 95%
			Low	Med	High	Low	Med	High	Low	Med	High			
		inch	bu/ac			plants/ft^2			bu/ac			%		
PSR01	Wallace-Woodworth	12	3.4	4.1	4.8	5.6	6.7	7.2	37	40	38.2	6.2	0.3471	**No**
PSR03	Glenella-Lansdowne	10	2.2	2.9	3.6	n/a	n/a	n/a	32	32.9	34.5	21.2	0.487	**No**
PSR04	Roland	10	2.4	3.1	3.8	3.9	5.5	7.0	38.3	36.2	38.8	4.5	0.0703	**No**
PSR07	Dauphin	10	2.9	3.7	4.6	3.4	4.3	4.9	61.5	62	64.2	7.2	0.3763	**No**

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Pea Seeding Rate Trial

Trial ID: 2021-PSR01 – R.M. of Wallace-Woodworth

Objective: Quantify the agronomic and economic impacts of different pea seeding rates

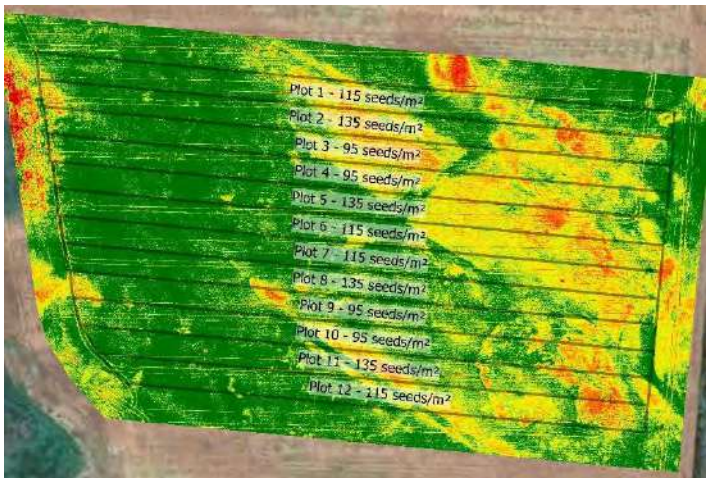
Summary: There was no significant yield difference between seeding rates of 95, 115 and 135 seeds/m^2. As a result, there was a decrease in profit/ac, equivalent to the increase in seed cost for the higher seeding rates.

Trial Information ǂ

Treatment ǂ	95 vs. 115 vs. 135 seed/m^2
Soil Texture	Loam
Previous Crop	Canola
Tillage	Zero Till
Seeding Equipment	60 ft Air Seeder
Seeding Date	April 24
Variety	AAC Chrome
Germination	84%
Row Spacing	12″
Harvest Date	August 4

ǂ Equivalent to 3.4 vs. 4.1 vs. 4.8 bu/ac seeding rates

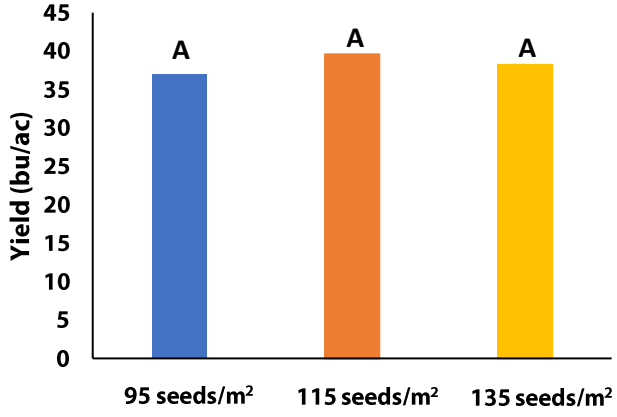
NDVI Field Image July 12



Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	24.5	89.4	20.1	110	243.6
Normal	40.7	78.7	58.5	52.9	230.8
% Normal	60%	114%	34%	207%	106%

Yield by Treatment



Plant Stand (plants/ac) ǂ

Rate	V4		R6	
seeds/m^2	plants/ac	plants/m^2	plants/ac	plants/m^2
95	306,000	76	243,000	60
115	318,000	79	291,000	72
135	366,000	90	314,000	78

ǂ 80-90 plants/m^2 is the current stand recommendation for peas in MB

Overall Yield & Economics

	Mean (bu/ac)	Cost ǂ	Change in Profit/ac ǂǂ
95 seeds/m^2	37.0	$57/ac	
115 seeds/m^2	40.0	$69/ac	-$12
135 seeds/m^2	38.2	$81/ac	-$24
P-Value	0.3471	**Economic**	95 seeds/m^2 → 115 seeds/m^2 No
CV	6.2%		95 seeds/m^2 → 135 seeds/m^2 No
Significance	**No**		115 seeds/m^2 → 135 seeds/m^2 No

ǂ Based on MB Agriculture 2021 Cost of Production Guidelines ($16.83/bu)

ǂǂ Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost.

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Pea Seeding Rate Trial

Trial ID: 2021-PSR03 – R.M. of Glenella-Lansdowne

Objective: Quantify the agronomic and economic impacts of different pea seeding rates

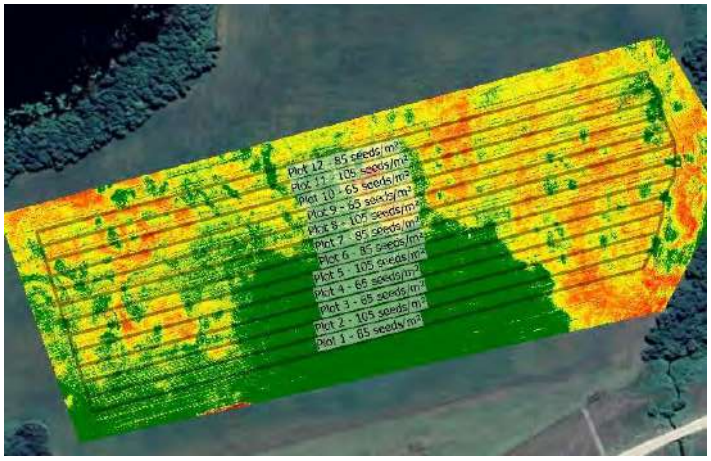
Summary: There was no significant yield difference between seeding rates of 65, 85 and 105 seeds/m^2. As a result, there was a decrease in profit/ac, equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment†	65 vs. 85 vs. 105 seeds/m^2
Soil Texture	Loamy Fine Sand
Previous Crop	Ryegrass
Tillage	Conventional
Seeding Equipment	43 ft Disc Drill
Seeding Date	April 27
Variety	CDC Amarillo
Germination	93%
Row Spacing	10″
Harvest Date	August 12

† Equivalent to 2.2 vs. 2.9 vs. 3.6 bu/ac seeding rates

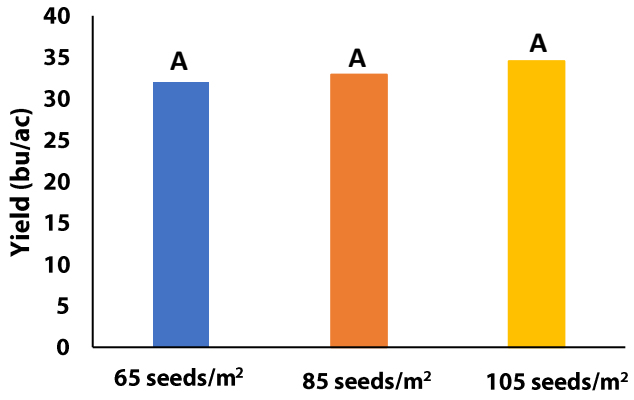
NDVI Field Image July 12



Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	19.9	60.8	56.6	147	284.5
Normal	56.5	78	80.2	68.7	283.4
% Normal	35%	78%	71%	214%	100%

Yield by Treatment



Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
65 seeds/m^2	32.0	$37/ac	
85 seeds/m^2	32.9	$49/ac	-$12/ac
105 seeds/m^2	34.5	$60/ac	-$23/ac
P-Value	0.487	**Economic**	65 seeds/m^2 → 85 seeds/m^2 No
CV	21.2%		65 seeds/m^2 → 105 seeds/m^2 No
Significance	**No**		85 seeds/m^2 → 105 seeds/m^2 No

† Based on MB Agriculture 2021 Cost of Production Guidelines ($16.83/bu)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost.

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Pea Seeding Rate Trial

Trial ID: 2021-PSR04 – R.M. of Roland

Objective: Quantify the agronomic and economic impacts of different pea seeding rates

Summary: There was no significant yield difference between seeding rates of 70, 90 and 110 seeds/m^2. As a result, there was a decrease in profit/ac, equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment ǂ	70 vs. 90 vs. 110 seeds/m^2
Soil Texture	Loamy Very Fine Sand / Clay
Previous Crop	Dry Beans
Tillage	Conventional
Seeding Equipment	40 ft Air Drill
Seeding Date	April 27
Variety	CDC Lewochko
Germination	89%
Row Spacing	10"
Harvest Date	August 2

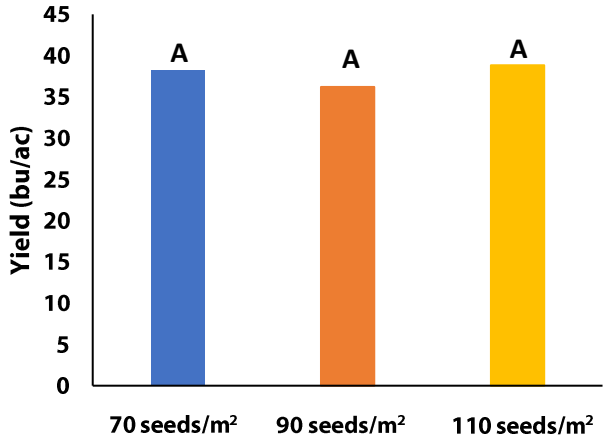
ǂ Equivalent to 2.4 vs. 3.1 vs. 3.8 bu/ac seeding rates

NDVI Field Image July 13

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	29	104	17.9	77.7	228.8
Normal	53.8	80.6	65.7	71	271.1
% Normal	54%	129%	27%	109%	84%

Yield by Treatment



Plant Stand (plants/ac) ǂ

Rate	V4		R7	
seeds/m^2	plants/ac	plants/m^2	plants/ac	plants/m^2
70	207,000	51	172,000	43
90	240,000	59	238,000	59
110	302,000	75	306,000	76

ǂ 80-90 plants/m^2 is the current stand recommendation for peas in MB

Overall Yield & Economics

	Mean (bu/ac)	Cost ǂ	Change in Profit/ac ǂǂ
70 seeds/m^2	38.3	$40/ac	
90 seeds/m^2	36.2	$52/ac	-$12/ac
110 seeds/m^2	38.8	$63/ac	-$23
P-Value	0.0703	**Economic**	70 seeds/m^2 → 90 seeds/m^2 No
CV	4.5%		70 seeds/m^2 → 110 seeds/m^2 No
Significance	**No**		90 seeds/m^2 → 110 seeds/m^2 No

ǂ Based on MB Agriculture 2021 Cost of Production Guidelines ($16.83/bu)

ǂǂ Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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Pea Seeding Rate Trial

Trial ID: 2021-PSR07 – R.M. of Dauphin

Objective: Quantify the agronomic and economic impacts of different pea seeding rates

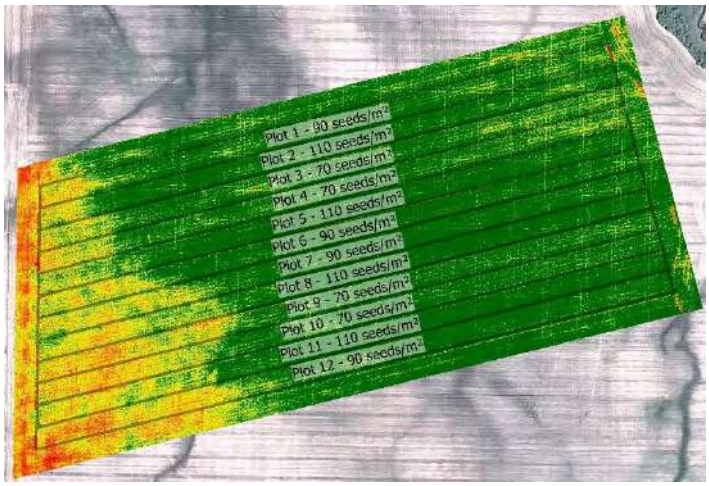
Summary: There was no significant yield difference between seeding rates of 70, 90 and 110 seeds/m^2. As a result, there was a decrease in profit/ac, equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment†	70 vs. 90 vs. 110 seeds/m^2
Soil Texture	Clay / Loam
Previous Crop	Wheat
Tillage	Zero Till
Seeding Equipment	74 ft Disc Drill
Seeding Date	May 11
Variety	Abarth
Germination	70%
Row Spacing	10″
Harvest Date	August 31

† Equivalent to 2.9 vs. 3.7 vs. 4.6 bu/ac seeding rates

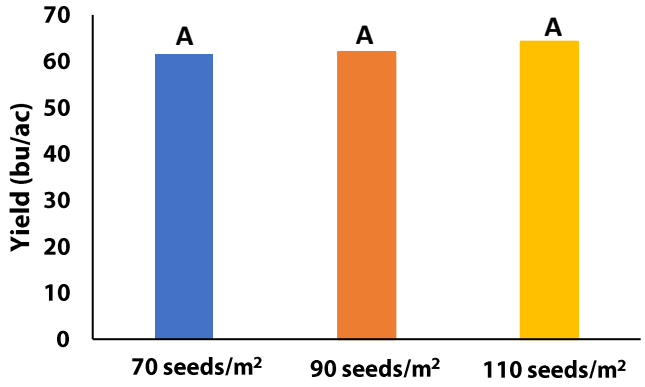
NDVI Field Image July 9



Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	28.4	90.7	32.4	102	253.7
Normal	54.3	86.7	73.2	63.3	277.5
% Normal	52%	105%	44%	161%	91%

Yield by Treatment



Plant Stand (plants/ac)†

Rate	V7		R7	
seeds/m^2	plants/ac	plants/m^2	plants/ac	plants/m^2
70	148,000	37	149,000	37
90	168,000	42	187,000	46
110	227,000	56	212,000	52

† 80-90 plants/m^2 is the current stand recommendation for peas in MB

Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
70 seeds/m^2	61.5	$49/ac	
90 seeds/m^2	62.0	$63/ac	-$14/ac
110 seeds/m^2	64.2	$77/ac	-$28/ac
P-Value	0.3763	**Economic**	70 seeds/m^2 → 90 seeds/m^2 No
CV	7.2%		70 seeds/m^2 → 110 seeds/m^2 No
Significance	**No**		90 seeds/m^2 → 110 seeds/m^2 No

† Based on MB Agriculture 2021 Cost of Production Guidelines ($16.83/bu)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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NOTES

Soybean Inoculant Trials – Double Inoculant vs. Single Inoculant

Objective: Quantify the agronomic and economic impacts of seed-applied inoculant (single inoculation) vs. seed-applied plus in-furrow inoculant (double inoculation) in soybeans. This trial requires a minimum field history of two previous soybean crops.

Summary: There was a significant yield difference between soybeans with double inoculant and soybeans with single inoculant at one site (S2IN06) out of of seven. Nodulation ratings were similar between treatments for each trial.

Summary of 2021 soybean double inoculant trial yield results by site-year.

Trial ID	Rural Municipality	Seeding Date	Nodule Rating R1-R2 (0-4 scale)		Yield		Yield Difference	CV	P-Value	Statistically Significant @ 95%
			Double	Single	Double	Single				
					bu/ac		bu/ac	%		
S2IN01	Dauphin	May 11	3.4	3.3	42.3	43.4	-1.1	2.3	0.2095	**No**
S2IN02	Dauphin	May 14	3.8	3.6	26.6	27.1	-0.5	10.0	0.1506	**No**
S2IN03	Wallace-Woodworth	May 13	4	4	32.9	33.8	-0.9	8.9	0.6594	**No**
S2IN04	Westlake-Gladstone	May 15	4	4	28.8	29.1	-0.3	19.0	0.8976	**No**
S2IN05	St. Andrews	May 15	3.3	3.3	31.4	30.3	1.1	8.7	0.6031	**No**
S2IN06	Dauphin	May 17	4	4	43.4	41.2	2.2	5.2	0.0422	**Yes**
S2IN07	Louise	May 26	3.5	3.3	35.9	37.5	-1.6	3.7	0.1346	**No**

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Soybean Double Inoculant Trial

Trial ID: 2021-S2IN01 – R.M. of Dauphin

Objective: Quantify the agronomic and economic impacts of seed applied inoculant (single inoculation) vs. seed applied plus in-furrow inoculant (double inoculation) in soybeans. This trial requires a minimum field history of 2 previous soybean crops.

Summary: Nodulation ratings were very similar between treatments and indicated agronomically sufficient nodulation. There was no significant yield difference between single and double inoculated soybeans. Due to the lack of yield response, there was a decrease in profit/ac in the double inoculated area of the trial, equivalent to the cost of the in-furrow inoculant application.

Trial Information

Treatment	1x Signum Soybean (on-seed) 5 lbs/ac Nodulator (granular)
Last Soybean Crop	2018
Soybean History	2-year history
Soil Texture	Loam
Previous Crop	Canola
Tillage	Conventional
Seeding Date	May 11
Variety	Amirani R2
Seeding Rate	200 000 seeds/ac
Row Spacing	10"
Plant Stand @ V2	140 000 plants/ac
Harvest Date	September 11

Precipitation (mm)

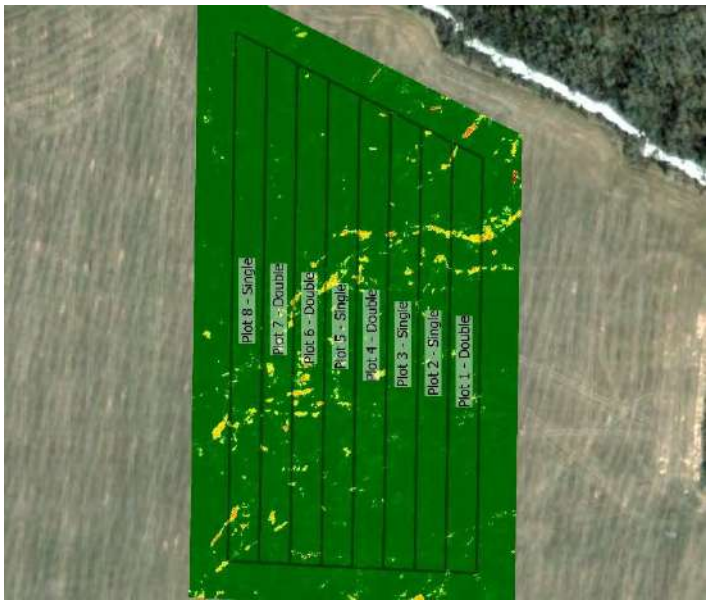
	May	Jun	Jul	Aug	Total
Rainfall	23.9	70.9	30.3	89.5	214.6
Normal	54.3	86.7	73.2	63.3	277.5
% Normal	44%	82%	41%	141%	77%

Nodulation†

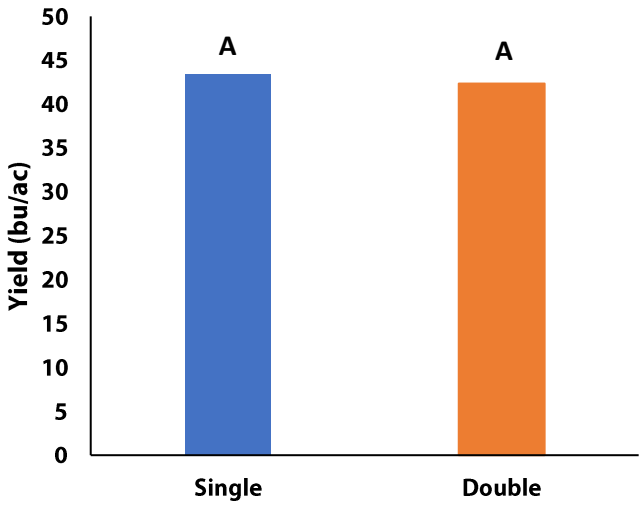
	Average Nodulation Rating @ R1
Double	3.4
Single	3.3

† 0 = no nodules, 1 = Poor (<5/plant), 2 = Fair (<10/plant), 3 = Good (<20/plant), 4 = Excellent (>20/plant)

NDVI Field Image August 17



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Double Inoculant	42.3	$13.50	-$10/ac
Single Inoculant	43.4	$3.50	
Yield Difference	-1.1		
P-Value	0.2095		
CV	2.3%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for on-seed + granular in-furrow vs. on-seed only

†† Because yields were not significantly different, there is no increased income with the double inoculant to offset the increase in price. Profit/ac declines by the increased cost as a result.

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Soybean Double Inoculant Trial

Trial ID: 2021-S2IN02 – R.M. of Dauphin

Objective: Quantify the agronomic and economic impacts of seed applied inoculant (single inoculation) vs. seed applied plus in-furrow inoculant (double inoculation) in soybeans. This trial requires a minimum field history of 2 previous soybean crops.

Summary: Nodulation ratings were very similar between treatments and indicated agronomically sufficient nodulation. There was no significant yield difference between single and double inoculated soybeans. Due to the lack of yield response, there was a decrease in profit/ac in the double inoculated area of the trial, equivalent to the cost of the in-furrow inoculant application.

Trial Information

Treatment	1x Nodulator (liquid on-seed) 6 lbs/ac Cell-Tech (granular)
Last Soybean Crop	2018
Soybean History	3-year history
Soil Texture	Clay
Previous Crop	Canola
Tillage	Zero Till
Seeding Date	May 14
Variety	Amirani R2
Seeding Rate	180 000 seeds/ac
Row Spacing	10"
Plant Stand @ V2	131 000 plants/ac
Harvest Date	September 15

Precipitation (mm)

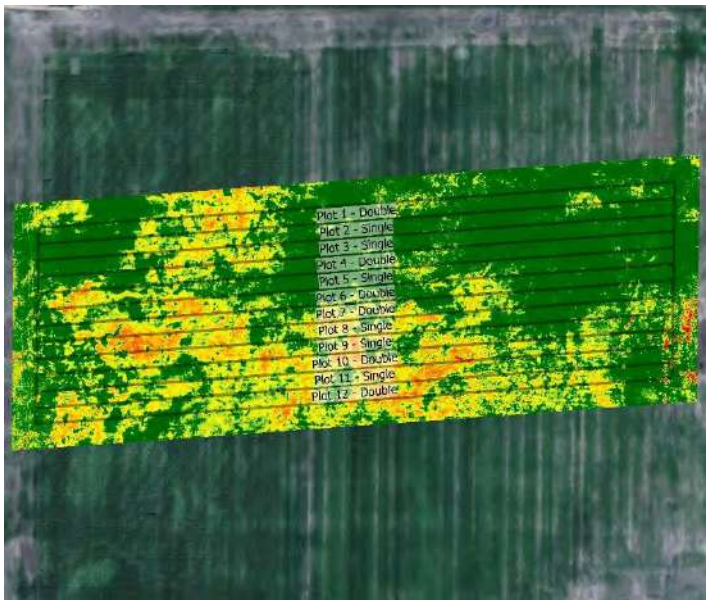
	May	Jun	Jul	Aug	Total
Rainfall	23.9	70.9	30.3	89.5	214.6
Normal	54.3	86.7	73.2	63.3	277.5
% Normal	44%	82%	41%	141%	77%

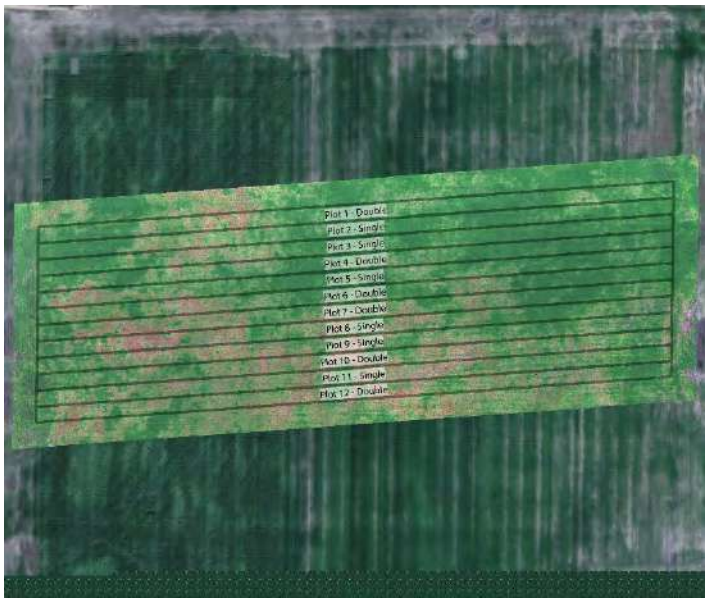
Nodulation†

	Average Nodulation Rating @ R1-2
Double	3.8
Single	3.6

† 0 = no nodules, 1 = Poor (<5/plant), 2 = Fair (<10/plant), 3 = Good (<20/plant), 4 = Excellent (>20/plant)

Field Images August 17





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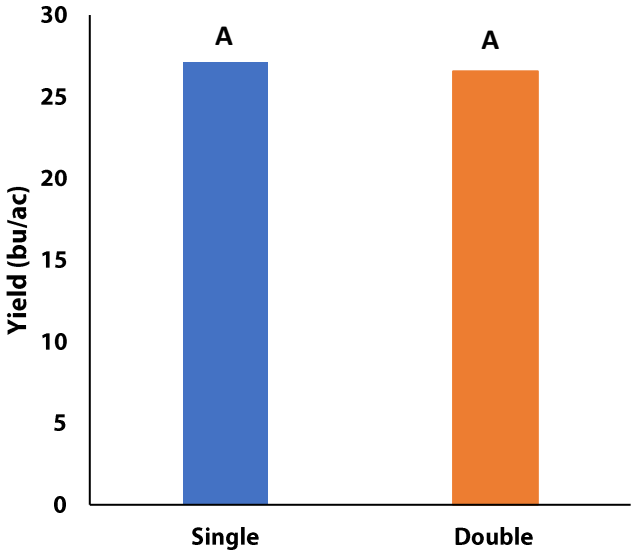
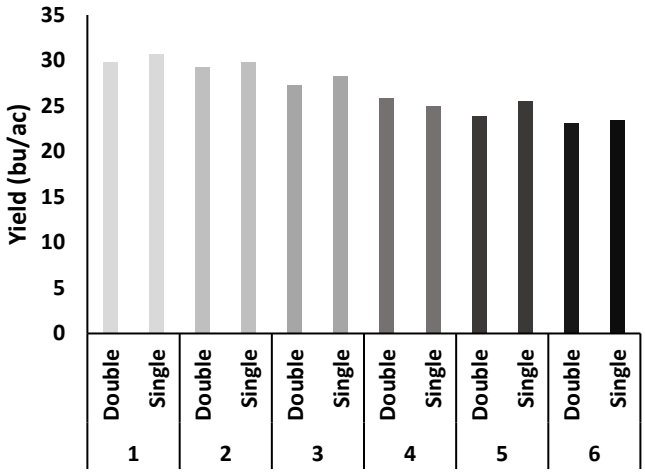
Yield by Treatment



Yield by Rep



Yield by rep is not useful for determining overall treatment effects. However, in this case where we have high variability across the trial (as seen in the NDVI image above), yield by rep is informative to determine whether data should be included or excluded from over treatment comparisons. In this case, yields from strips within reps are quite similar, and the majority of the variability is across replicates, rather than treatment strips within replicates. Thus, we determined yield data for all strips could be included in the overall analysis of treatment effects.

Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Double Inoculant	26.6	$13.50/ac	-$10/ac
Single Inoculant	27.1	$3.50/ac	
Yield Difference	-0.5		
P-Value	0.1506		
CV	10%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for on-seed + granular in-furrow vs. on-seed only

†† Because yields were not significantly different, there is no increased income with the double inoculant to offset the increase in price. Profit/ac declines by the increased cost as a result.

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Soybean Double Inoculant Trial

Trial ID: 2021-S2IN03 – R.M. of Wallace-Woodworth

Objective: Quantify the agronomic and economic impacts of seed applied inoculant (single inoculation) vs. seed applied plus in-furrow inoculant (double inoculation) in soybeans. This trial requires a minimum field history of 2 previous soybean crops.

Summary: Nodulation ratings were very similar between treatments and agronomically sufficient. There was no significant yield difference between single and double inoculated soybeans. Due to the lack of yield response, there was a decrease in profit/ac in the double inoculated area of the trial, equivalent to the cost of the in-furrow inoculant application.

Trial Information

Treatment	1x AGTIV® SOYBEAN • Powder (on-seed) 5 lbs/ac AGTIV® SOYBEAN • Granular
Last Soybean Crop	2018
Soybean History	3-year history
Soil Texture	Clay Loam
Previous Crop	Wheat
Tillage	Conventional
Seeding Date	May 13
Variety	P005A83X
Seeding Rate	194 500 seeds/ac
Row Spacing	12"
Plant Stand @ V2	158 000 plants/ac
Harvest Date	September 23

Precipitation (mm)

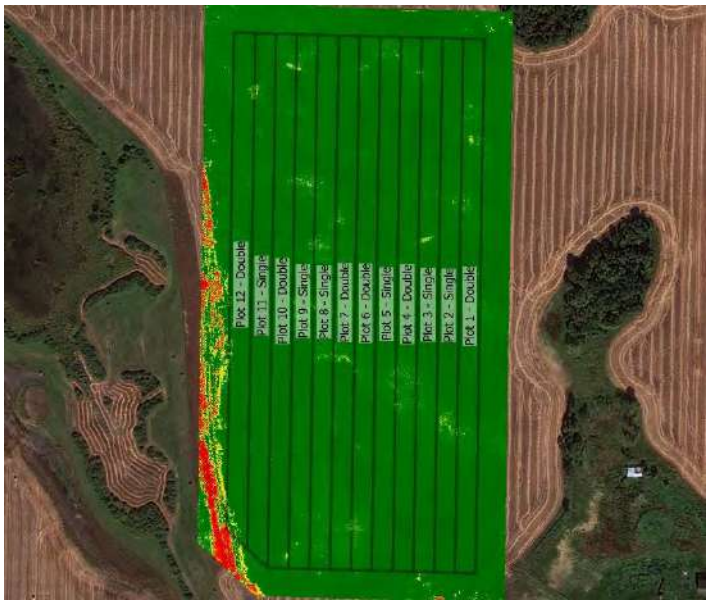
	May	Jun	Jul	Aug	Total
Rainfall	34.2	83.8	22.9	130	270.5
Normal	51.2	72.8	74.4	67.5	265.9
% Normal	67%	115%	31%	192%	102%

Nodulation†

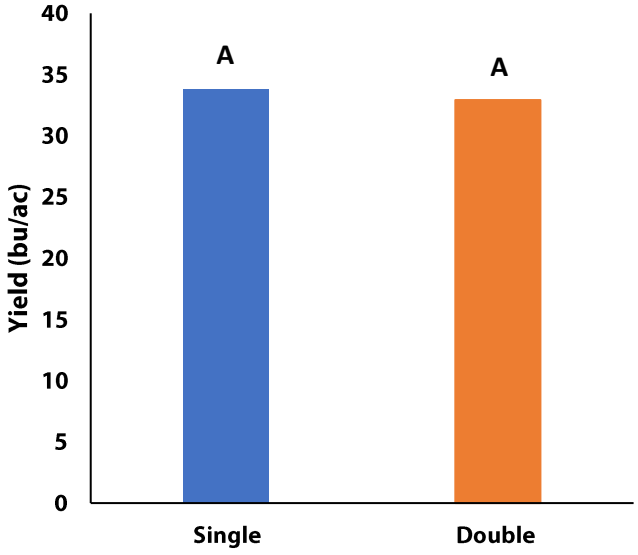
	Average Nodulation Rating @ R2
Double	4.0
Single	4.0

† 0 = no nodules, 1 = Poor (<5/plant), 2 = Fair (<10/plant), 3 = Good (<20/plant), 4 = Excellent (>20/plant)

NDVI Field Image August 13



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Double Inoculant	32.9	$13.50/ac	-$10/ac
Single Inoculant	33.8	$3.50/ac	
Yield Difference	-0.9		
P-Value	0.6594		
CV	8.9%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for on-seed + granular in-furrow vs. on-seed only

†† Because yields were not significantly different, there is no increased income with the double inoculant to offset the increase in price. Profit/ac declines by the increased cost as a result.

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Soybean Double Inoculant Trial

Trial ID: 2021-S2IN04 – R.M. of Westlake-Gladstone

Objective: Quantify the agronomic and economic impacts of seed applied inoculant (single inoculation) vs. seed applied plus in-furrow inoculant (double inoculation) in soybeans. This trial requires a minimum field history of 2 previous soybean crops.

Summary: Nodulation ratings were very similar between treatments and agronomically sufficient. There was no significant yield difference between single and double inoculated soybeans. Due to the lack of yield response, there was a decrease in profit/ac in the double inoculated area of the trial, equivalent to the cost of the in-furrow inoculant application.

Trial Information

Treatment	2x Nodulator (liquid on-seed) 3 lbs/ac Cell-Tech (granular)
Last Soybean Crop	2018
Soybean History	3-year history
Soil Texture	Fine Sandy Loam
Previous Crop	Canola
Tillage	Conventional
Seeding Date	May 15
Variety	P005A83X
Seeding Rate	150 000 seeds/ac
Row Spacing	30"
Plant Stand @ V2	121 000 plants/ac
Harvest Date	September 29

Precipitation (mm)

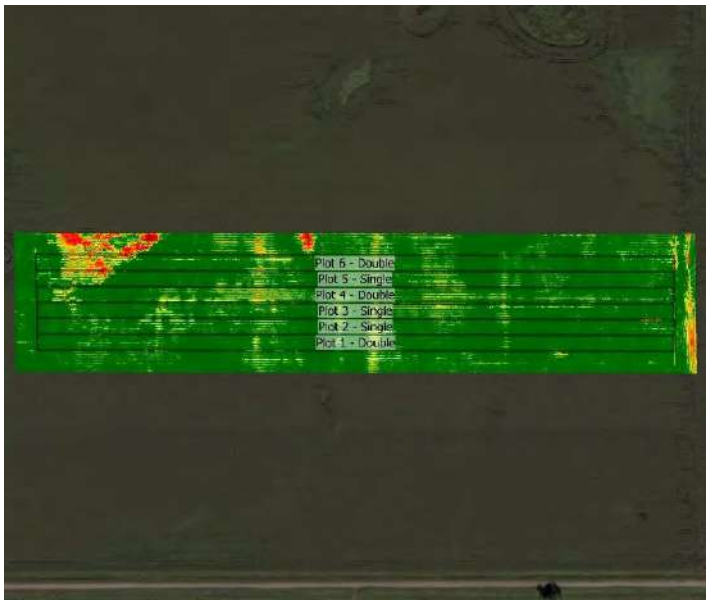
	May	Jun	Jul	Aug	Total
Rainfall	35.3	48.3	8.9	119	211.5
Normal	52.7	70.5	73.5	67.7	264.4
% Normal	67%	69%	12%	176%	80%

Nodulation†

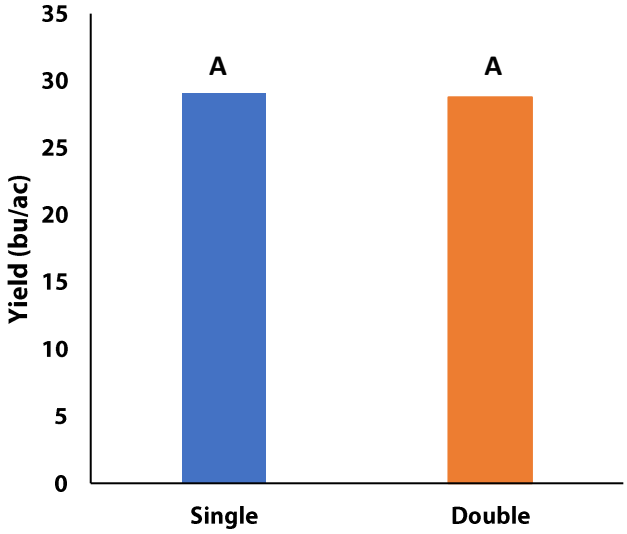
	Average Nodulation Rating @ R2
Double	4.0
Single	4.0

† 0 = no nodules, 1 = Poor (<5/plant), 2 = Fair (<10/plant), 3 = Good (<20/plant), 4 = Excellent (>20/plant)

NDVI Field Image August 16



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Double Inoculant	28.8	$13.50/ac	-$10/ac
Single Inoculant	29.1	$3.50/ac	
Yield Difference	-0.3		
P-Value	0.8976		
CV	19%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for on-seed + granular in-furrow vs. on-seed only

†† Because yields were not significantly different, there is no increased income with the double inoculant to offset the increase in price. Profit/ac declines by the increased cost as a result.

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Soybean Double Inoculant Trial

Trial ID: 2021-S2IN05 – R.M. of St. Andrews

Objective: Quantify the agronomic and economic impacts of seed applied inoculant (single inoculation) vs. seed applied plus in-furrow inoculant (double inoculation) in soybeans. This trial requires a minimum field history of 2 previous soybean crops.

Summary: Nodulation ratings were very similar between treatments and agronomically sufficient. There was no significant yield difference between single and double inoculated soybeans. Due to the lack of yield response, there was a decrease in profit/ac in the double inoculated area of the trial, equivalent to the cost of the in-furrow inoculant application.

Trial Information

Treatment	1x Nodulator (liquid on-seed) 5 lbs/ac Nodulator (granular)
Last Soybean Crop	2017
Soybean History	2-year history
Soil Texture	Clay
Previous Crop	Wheat
Tillage	Conventional
Seeding Date	May 15
Variety	P006A37X
Seeding Rate	185 000 seeds/ac
Row Spacing	10"
Plant Stand @ V2	135 000 plants/ac
Harvest Date	October 4

Precipitation (mm)

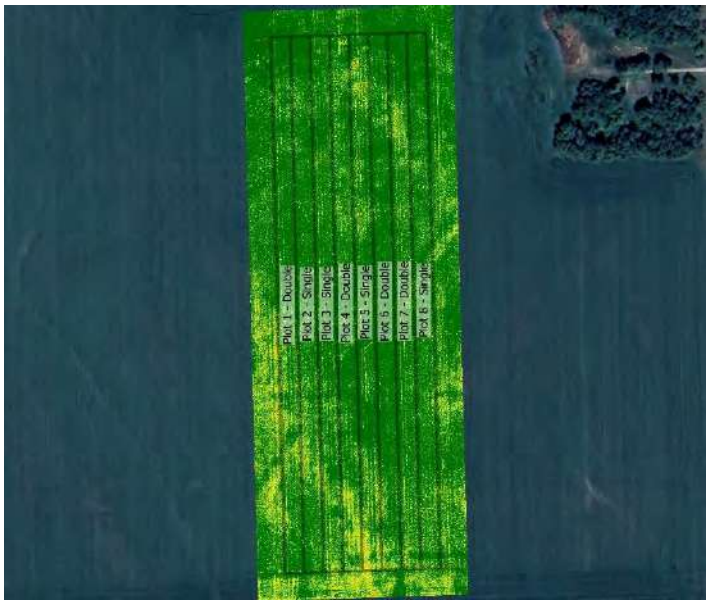
	May	Jun	Jul	Aug	Total
Rainfall	39.2	32.7	25.7	86.8	184.4
Normal	53.8	92	66.4	63.3	275.5
% Normal	73%	36%	39%	137%	67%

Nodulation†

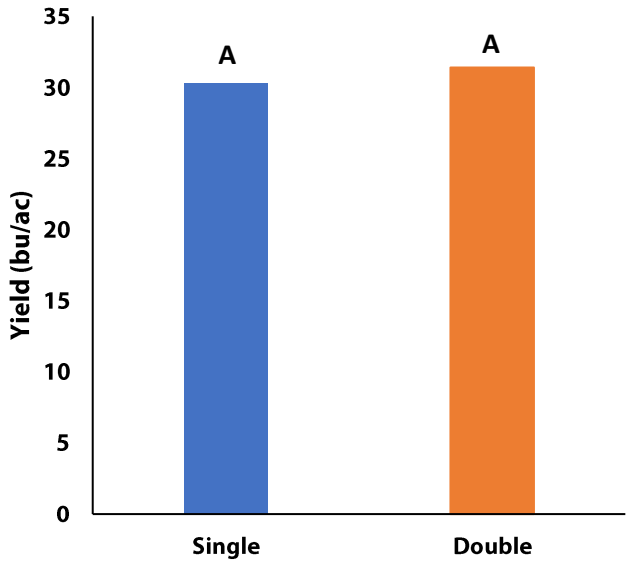
	Average Nodulation Rating @ R1
Double	3.3
Single	3.3

† 0 = no nodules, 1 = Poor (<5/plant), 2 = Fair (<10/plant), 3 = Good (<20/plant), 4 = Excellent (>20/plant)

NDVI Field Image August 15



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Double Inoculant	31.4	$13.50/ac	-$10/ac
Single Inoculant	30.3	$3.50/ac	
Yield Difference	1.1		
P-Value	0.6031		
CV	8.7%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for on-seed + granular in-furrow vs. on-seed only

†† Because yields were not significantly different, there is no increased income with the double inoculant to offset the increase in price. Profit/ac declines by the increased cost as a result.

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Soybean Double Inoculant Trial

Trial ID: 2021-S2IN06 – R.M. of Dauphin

Objective: Quantify the agronomic and economic impacts of seed applied inoculant (single inoculation) vs. seed applied plus in-furrow inoculant (double inoculation) in soybeans. This trial requires a minimum field history of 2 previous soybean crops.

Summary: Nodulation ratings were the same for both double and single inoculated soybeans, and nodulation was agronomically sufficient. Soybean seed yield significantly increased by 2.2 bu/ac with double inoculation compared to single inoculation. Double inoculation resulted in an increase in profit/ac compared to single inoculation.

Trial Information

Treatment	1x Signum Soybean Nodulator Granular
Last Soybean Crop	2017
Soybean History	2-year history
Soil Texture	Clay
Previous Crop	Canola
Tillage	Conventional
Seeding Date	May 17
Variety	DKB0009-89
Seeding Rate	190 000 seeds/ac
Row Spacing	10"
Plant Stand @ V1	134 000 plants/ac
Harvest Date	September 22

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	23.9	70.9	30.3	89.5	214.6
Normal	54.3	86.7	73.2	63.3	277.5
% Normal	44%	82%	41%	141%	77%

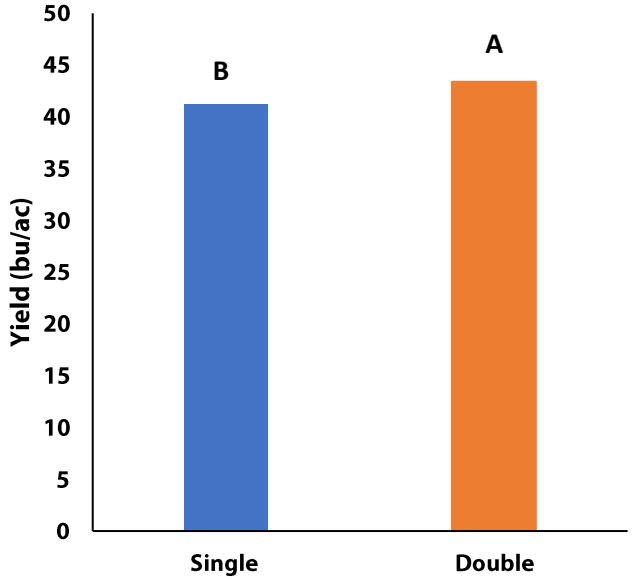
Nodulation†

	Average Nodulation Rating @ R1
Double	4.0
Single	4.0

† 0 = no nodules, 1 = Poor (<5/plant), 2 = Fair (<10/plant), 3 = Good (<20/plant), 4 = Excellent (>20/plant)

NDVI Field Image August 17

Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††	
			Long-Term Average ($11-12/bu)	Current Conditions ($13-15/bu)
Double Inoculant	43.4	$13.50/ac	$14 to $16/ac	$17 to $23/ac
Single Inoculant	41.2	$3.50/ac		
Yield Difference	2.2			
P-Value	0.0422			
CV	5.2%			
Significance	**Yes**	**Economic**	**Yes**	**Yes**

† Based on an estimated cost for on-seed + granular in-furrow vs. on-seed only

†† Profit is the difference between the change in income/ac, from a significant difference in yield, and the change in cost/ac with for the double inoculant practice. Profit is presented as a range across long-term average soybean prices, and those more similar to current market conditions

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Soybean Double Inoculant Trial

Trial ID: 2021-S2IN07 – R.M. of Louise

Objective: Quantify the agronomic and economic impacts of seed applied inoculant (single inoculation) vs. seed applied plus in-furrow inoculant (double inoculation) in soybeans. This trial requires a minimum field history of 2 previous soybean crops.

Summary: Nodulation ratings were very similar between treatments, and nodulation was agronomically sufficient. There was no significant yield difference between single and double inoculated soybeans. Due to the lack of yield response, there was a decrease in profit/ac in the double inoculated area of the trial, equivalent to the cost of the in-furrow inoculant application.

Trial Information

Treatment	1x Optimize (liquid on-seed) 4.5 lbs/ac Nodulator (granular)
Last Soybean Crop	2017
Soybean History	2-year history
Soil Texture	Clay Loam
Previous Crop	Barley
Tillage	Zero Till
Seeding Date	May 26
Seeding Rate	166 000 seeds/ac
Row Spacing	7.5"
Plant Stand @ V1	131 000 plants/ac
Harvest Date	September 26

Precipitation (mm)

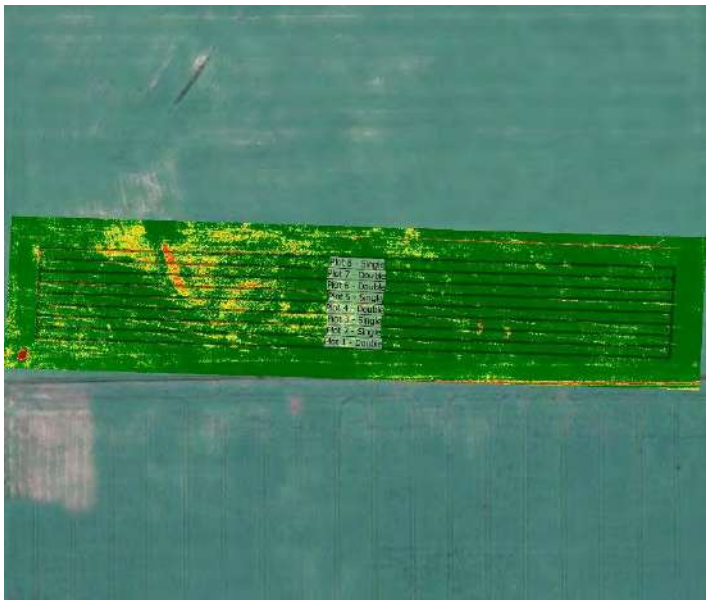
	May	Jun	Jul	Aug	Total
Rainfall	33.6	93.4	13.3	61.1	201.4
Normal	61.1	89.8	68.3	72.3	291.5
% Normal	55%	104%	19%	85%	69%

Nodulation‡

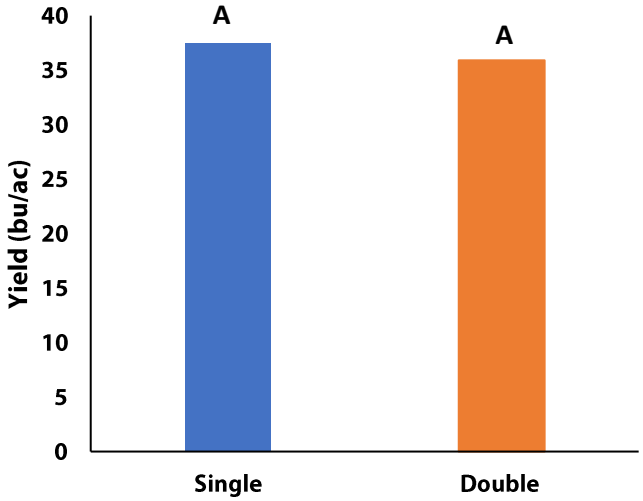
	Average Nodulation Rating @ R1
Double	3.5
Single	3.3

‡ 0 = no nodules, 1 = Poor (<5/plant), 2 = Fair (<10/plant), 3 = Good (<20/plant), 4 = Excellent (>20/plant)

NDVI Field Image August 13



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Double Inoculant	35.9	$13.50/ac	-$10/ac
Single Inoculant	37.5	$3.50/ac	
Yield Difference	-1.6		
P-Value	0.1346		
CV	3.7%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for on-seed + granular in-furrow vs. on-seed only

†† Because yields were not significantly different, there is no increased income with the double inoculant to offset the increase in price. Profit/ac declines by the increased cost as a result.

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NOTES

Soybean Inoculant Trials – Single Inoculant vs. No Inoculant

Objective: Quantify the agronomic impacts of seed-applied inoculant (single inoculation) vs. no inoculant applied in soybean fields. This trial requires a minimum field history of three previous soybean crops.

Summary: There was no significant yield difference for soybeans with and without single inoculant. Nodulation ratings were similar between the treatments for each trial.

Summary of 2021 soybean single inoculant trial yield results by site-year.

Trial ID	Rural Municipality	Seeding Date	Nodule Rating @ R1 0-4		Yield		Yield Difference	CV	P-Value	Statistically Significant @ 95%
			Inoculated	None	Inoculated	None	bu/ac	%		
S1IN01	Hanover	May 10	2.9	2.9	34.6	35.7	-1.1	5.9	0.1722	**No**
ǂ S1IN02	MacDonald	May 10	2.6	2.4	11.4	10.6	0.8	15.0	0.1312	**No**
S1IN03	Montcalm	May 12	3.2	3.2	45	44.3	0.7	4.1	0.6692	**No**

ǂ Additiona treatment (EcoTea) information can be found in single page report

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Soybean Single Inoculant Trial

Trial ID: 2021-S1IN01 – R.M. of Hanover

Objective: Quantify the agronomic impacts of seed applied inoculant (single inoculation) vs. no inoculant in soybean fields. This trial requires a minimum field history of three previous soybean crops.

Summary: Nodulation was very similar between treatments. There was no significant yield difference between soybeans with and without a single inoculant. Due to the lack of yield response, there was a decrease in profit/ac in the inoculated area of the trial, equivalent to the cost of the seed-applied inoculant.

Trial Information

Treatment	1x Nodulator (liquid + peat)
Last Soybean Crop	2018
Soybean History	6-year history
Soil Texture	Clay
Previous Crop	Canola
Tillage	Conventional
Seeding Date	May 10
Variety	RX Acron
Seeding Rate	210 000 seeds/ac
Row Spacing	10"
Plant Stand @ V2	150,000 plants/ac
Harvest Date	September 27

Precipitation (mm)

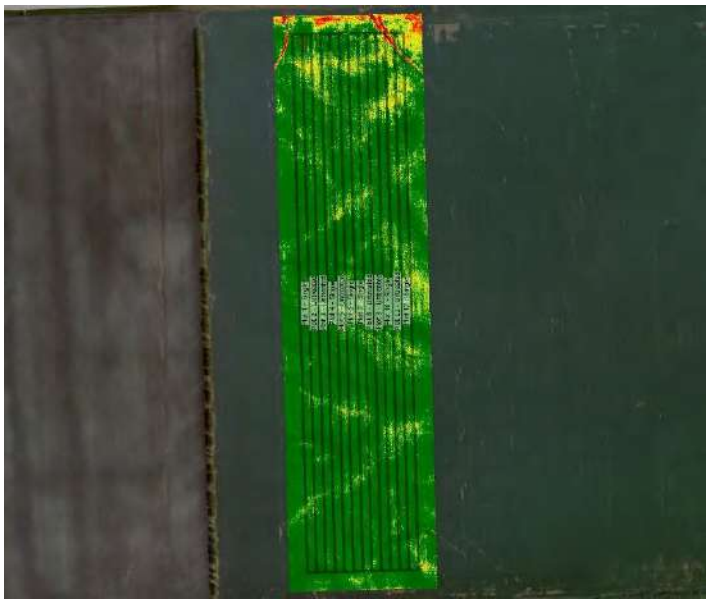
	May	Jun	Jul	Aug	Total
Rainfall	35.2	61.3	14.2	105	216.1
Normal	52.6	94.7	69.5	51.7	268.5
% Normal	67%	65%	20%	204%	80%

Nodulation†

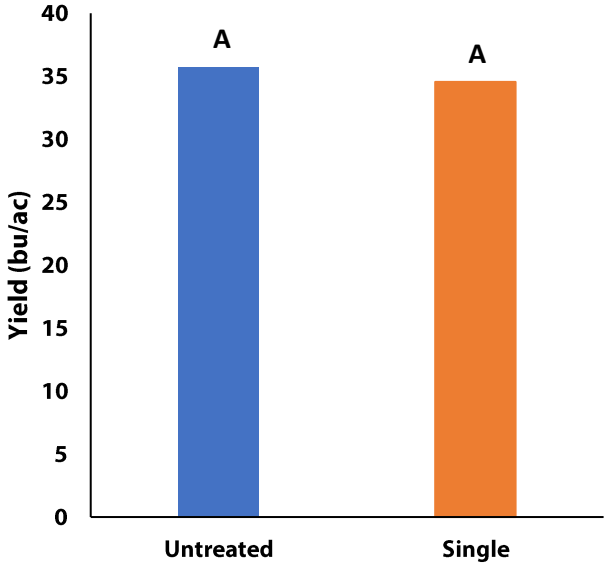
	Average nodulation rating @ R1
Single	2.9
None	2.9

† 0 = no nodules, 1 = Poor (<5/plant), 2 = Fair (<10/plant), 3 = Good (<20/plant), 4 = Excellent (>20/plant)

NDVI Field Image August 14



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Single Inoculant	34.6	$3.50/ac	-$3.50/ac
Untreated	35.7		
Yield Difference	-1.1		
P-Value	0.1722		
CV	5.9%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for on-seed inoculant

†† Because yields were not significantly different, there was no increased income to offset the cost of the single inoculant. Profit/ac decreases by the cost of the inoculant as a result.

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Soybean Single Inoculant Trial

Trial ID: 2021-S1IN02 – R.M. of MacDonald

Objective: Quantify the agronomic impacts of seed applied inoculant (single inoculation) vs. no inoculant in soybean fields. This trial requires a minimum field history of three previous soybean crops.

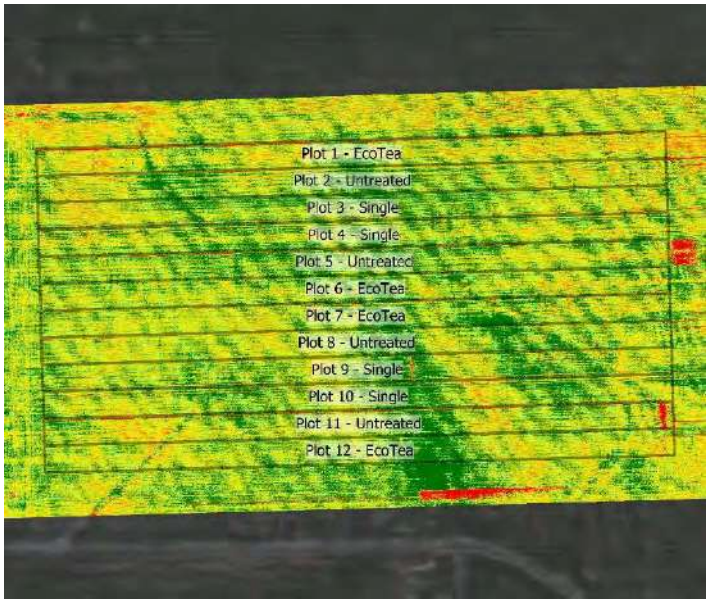
Summary: Nodulation was very similar between treatments. There was no significant yield difference between soybeans with and without a single inoculant. EcoTea did not have a significant effect on yield. Due to the lack of yield response, there was a decrease in profit/ac in the inoculated area of the trial, equivalent to the cost of the seed-applied inoculant, and a loss in profit/ac equivalent to the cost of EcoTea application.

Trial Information

Treatment†	1x Nodulator (liquid) EcoTea™
Last Soybean Crop	2018
Soybean History	3-year history
Soil Texture	Clay
Previous Crop	Oats
Tillage	Conventional
Seeding Date	May 10
Variety	P006A37X
Seeding Rate	164 000 seeds/ac
Row Spacing	20"
Plant Stand @ V1	130 000 plants/ac
Harvest Date	October 6

† EcoTea™ applied on-seed; intended to help seedling root growth, nutrient use and reduce disease

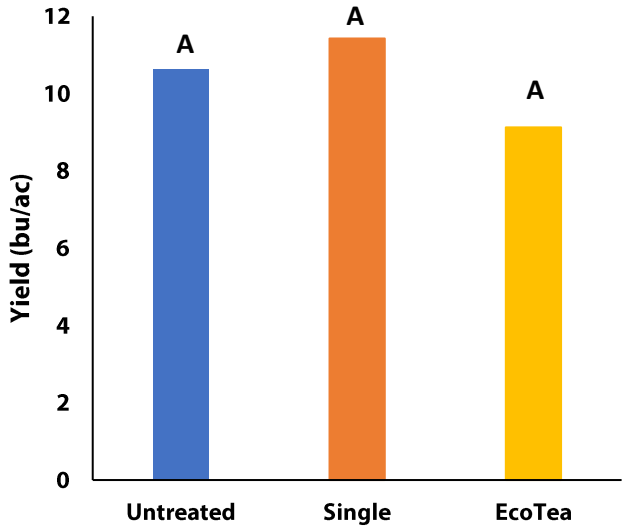
NDVI Field Image August 14



Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	67.5	57	9.2	62.6	196.3
Normal	58.5	92	77.8	67.6	295.9
% Normal	115%	62%	12%	93%	66%

Yield by Treatment



Nodulation†

	Average nodulation rating @ R1
Single	2.6
None	2.4
EcoTea	2.6

† 0 = no nodules, 1 = Poor (<5/plant), 2 = Fair (<10/plant), 3 = Good (<20/plant), 4 = Excellent (>20/plant)

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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Single Inoculant	11.4	$3.50/ac	-$3.50/ac
Untreated	10.6		
EcoTea	9.1	$7/ac	-$7/ac
P-Value	0.1312		
CV	15%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for on-seed inoculant and biological products

†† Because yields were not significantly different, there was no increased income to offset the cost of the single inoculant. Profit/ac decreased by the cost of the single inoculant as a result.

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Soybean Single Inoculant Trial

Trial ID: 2021-S1IN03 – R.M. of Montcalm

Objective: Quantify the agronomic impacts of seed applied inoculant (single inoculation) vs. no inoculant in soybean fields. This trial requires a minimum field history of three previous soybean crops.

Summary: Nodulation was the same, and agronomically sufficient, for both single and uninoculated soybeans. There was no significant yield difference between soybeans with and without a single inoculant. Due to the lack of yield response, there was a decrease in profit/ac in the inoculated area of the trial, equivalent to the cost of the seed-applied inoculant.

Trial Information

Treatment	1x XiteBio® SoyRhizo®
Last Soybean Crop	2018
Soybean History	3-year history
Soil Texture	Clay
Previous Crop	Canola
Tillage	Conventional
Seeding Date	May 12
Variety	Stanley
Seeding Rate	183 000 seeds/ac
Row Spacing	30"
Plant Stand @ V1	115 000 plants/ac
Harvest Date	October 1

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	46.3	63.6	32.3	142	284
Normal	56.4	85.2	75.4	65.5	282.5
% Normal	82%	75%	43%	216%	101%

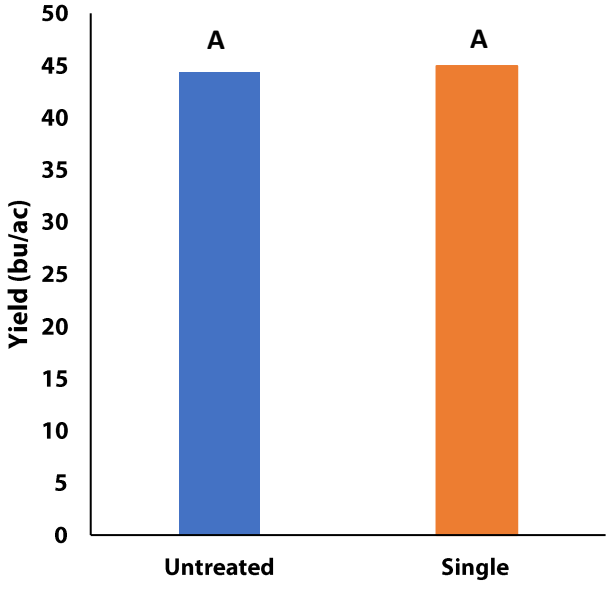
Nodulation†

	Average nodulation rating @ R1
Single	3.2
None	3.2

† 0 = no nodules, 1 = Poor (<5/plant), 2 = Fair (<10/plant), 3 = Good (<20/plant), 4 = Excellent (>20/plant)

NDVI Field Image August 13

Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Single Inoculant	45.0	$3.50/ac	-$3.50/ac
Untreated	44.3		
Yield Difference	0.7		
P-Value	0.6692		
CV	4.1%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for on-seed inoculant

†† Because yields were not significantly different, there was no increased income to offset the cost of the single inoculant. Profit/ac decreased by the cost of single inoculant as a result.

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NOTES

Soybean Seeding Rate Trials

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates.

Summary: For all soybean seeding rate trials, there was no significant yield difference between treatments.

Summary of 2021 soybean seeding rate trial yield results by site-year.

Trial ID	Rural Municipality	Row Spacing	Seeding Rate			Plant Stand @ Midseason			Yield			CV	P-Value	Statistically Significant @ 95%
			Low	Med	High	Low	Med	High	Low	Med	High			
		inch	'000/ac			'000/ac			bu/ac			%		
SSR01	De Salaberry	10	130	160	190	85	99	97	42	44	42.1	5.3	0.2878	**No**
SSR02	Grey	20	100	130	160	40	85	96	20	20.8	20.5	6.7	0.5063	**No**
SSR03	Brokenhead	15	120	150	180	79	96	97	36.8	38	36.3	8.3	0.5506	**No**
SSR04	Grey	15	120	150	180	84	110	127	18.2	17.3	18.1	6.4	0.6077	**No**
SSR05	St. Andrews	10	140	170	200	155	183	212	43.3	44.2	41.8	7.4	0.4324	**No**
SSR06	Richot	22	108	138	168	86	91	112	27.6	27.2	28.1	3.2	0.465	**No**
SSR07	Glenella-Lansdowne	10	130	160	190	101	136	143	26	26.3	26.4	12	0.9511	**No**
SSR08	Ste. Anne	22	115	145	175	85	109	133	23.6	23.2	23.2	4.1	0.8663	**No**
SSR09	Grey	10	122	146	180	107	119	167	38.1	43.5	43.4	12	0.0563	**No**
SSR10	Westlake-Gladstone	30	120	150	180	104	117	129	27.4	26.9	27.4	13	0.9604	**No**
SSR11	St. Andrews	10	125	155	185	79	103	103	29.4	29.6	30.5	3.2	0.3792	**No**
SSR12	Grassland	15	125	155	185	103	125	166	23.1	21.2	22.2	7.5	0.4621	**No**
SSR13	Grassland	12	130	160	190	109	126	145	50.5	48.5	51.8	8.5	0.5249	**No**
SSR14	Brokenhead	9	168	210	252	62	68	66	27.9	29.2	30.1	6.7	0.2892	**No**

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Soybean Seeding Rate Trial

Trial ID: 2021-SSR01 – R.M. of De Salaberry

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates

Summary: There was no significant yield difference between seeding rates of 130,000, 160,000 and 190,000 seeds/ac. As a result, there was a decrease in profit equivalent to the increase in seed cost for the higher seeding rates.

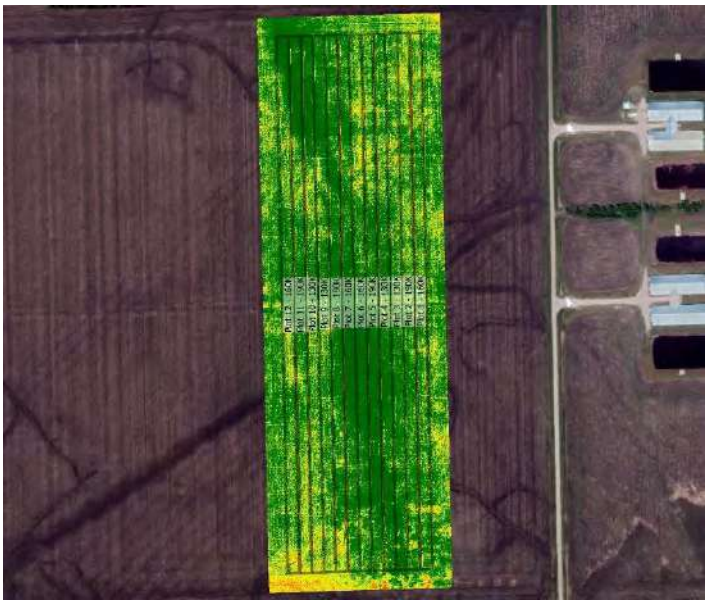
Trial Information

Treatment	130k vs. 160k vs. 190k
Soil Texture	Clay
Previous Crop	Wheat
Tillage	Conventional
Seeding Equipment	52 ft Air Drill
Seeding Date	May 5
Variety	DKB005-52
Germination	89%
Row Spacing	10″
Harvest Date	October 5

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	35.2	61.3	14.2	105	216.1
Normal	52.6	94.7	69.5	51.7	268.5
% Normal	67%	65%	20%	204%	80%

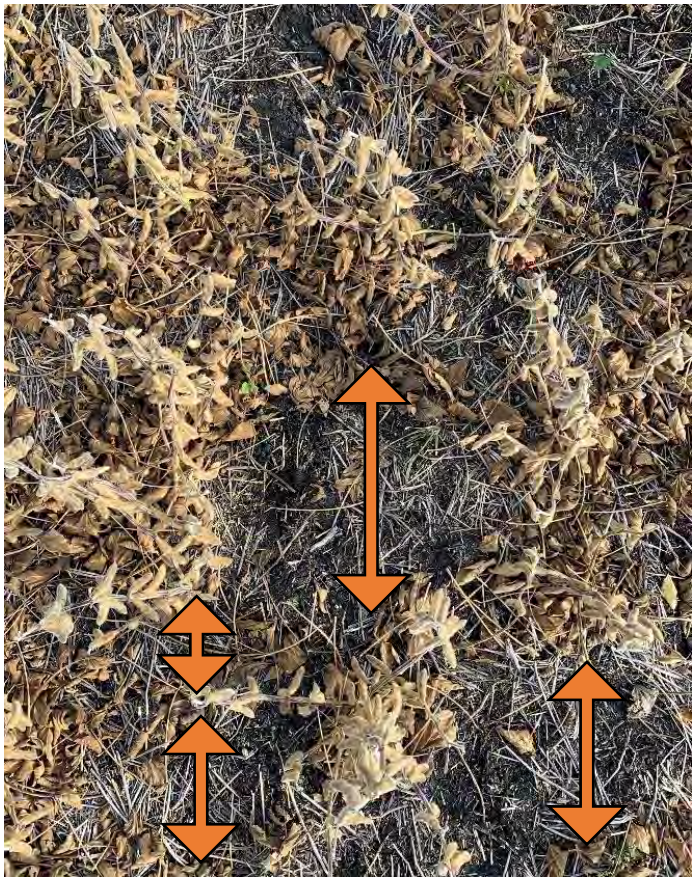
NDVI Field Image August 14



Plant Stand (plants/ac)

	V2	R8
130k	89,000	85,000
160k	104,000	99,000
190k	105,000	97,000

Field Observations



Observed lots of skips in the rows (orange arrows), across all seeding rate treatments. This could have contributed to low plant stands compared to target seeding rates.

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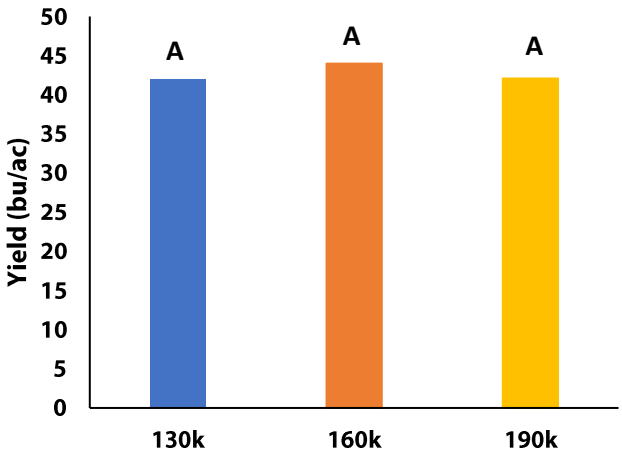
Yield by Treatment



Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
130k	42.0	$61/ac	
160k	44.0	$75/ac	-$14/ac
190k	42.1	$89/ac	-$28/ac
P-Value	0.2878	**Economic**	130k → 160k No
CV	5.3%		130k → 190k No
Significance	**No**		160k → 190k No

† Based on MB Agriculture 2021 Cost of Production Guidelines ($65.30/unit)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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Soybean Seeding Rate Trial

Trial ID: 2021-SSR02 – R.M. of Grey

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates

Summary: There was no significant yield difference between seeding rates of 100,000, 130,000 and 160,000 seeds/ac. As a result, there was a decrease in profit equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment	100k vs. 130k vs. 160k
Soil Texture	Clay
Previous Crop	Oats
Tillage	Conventional
Seeding Equipment	60 ft Planter
Seeding Date	May 8
Variety	DKB005-52
Germination	86%
Row Spacing	20"
Harvest Date	September 18

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	49.5	70.7	25.3	64.3	209.8
Normal	53.8	80.6	65.7	71	271.1
% Normal	92%	88%	39%	91%	77%

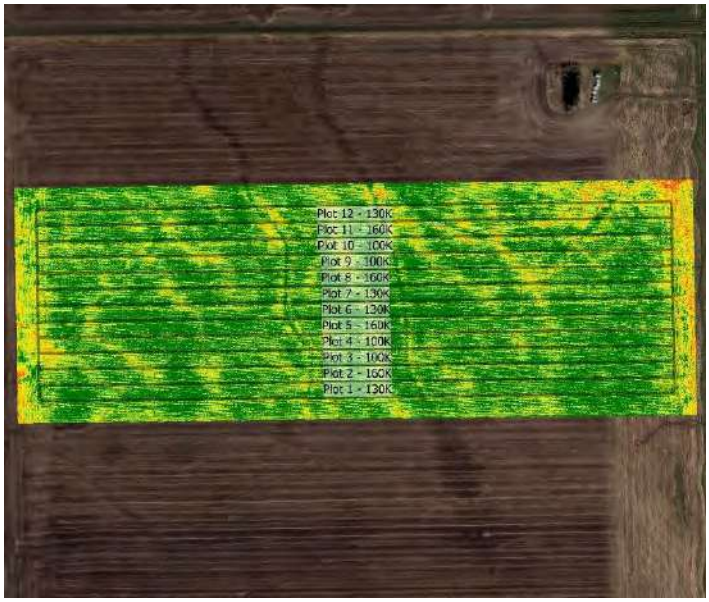
Plant Stand (plants/ac)

	V2	R8
100k	39,000	40,000
130k	46,000	85,000
160k	58,000	96,000

Early Season Observations May 26

Emergence was variable throughout the trial area, with some delayed emergence as seen in the series of images above.

NDVI Field Image August 16



Late Season Observations September 10

Very distinct differences in branching were observed between seeding rate treatments, with more branches per plant at the lowest seeding rate, compared to the medium and high seeding rates.

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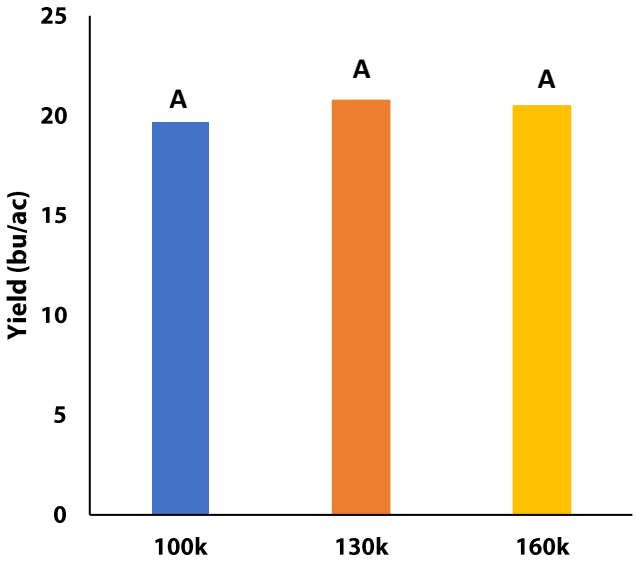
Yield by Treatment



Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
100k	20.0	$47/ac	
130k	20.8	$61/ac	-$14/ac
160k	20.5	$75/ac	-$28/ac
P-Value	0.5063	**Economic**	100k → 130k No
CV	6.7%		100k → 160k No
Significance	**No**		130k → 160k No

† Based on MB Agriculture 2020 Cost of Production Guidelines ($65.30/unit)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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Soybean Seeding Rate Trial

Trial ID: 2021-SSR03 – R.M. of Brokenhead

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates

Summary: There was no significant yield difference between seeding rates of 120,000, 150,000 and 180,000 seeds/ac. As a result, there was a decrease in profit equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment	120k vs. 150k vs. 180k
Soil Texture	Mesic / Clay Loam
Previous Crop	Winter Wheat
Tillage	Conventional
Seeding Equipment	40 ft Planter
Seeding Date	May 8
Variety	NSC Sperling RR2Y
Germination	83%
Row Spacing	15"
Harvest Date	September 24

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	51.6	25.8	27.8	87	192.2
Normal	54	89.9	73.4	72.6	289.9
% Normal	96%	29%	38%	120%	66%

Early Season Frost Damage (VC)

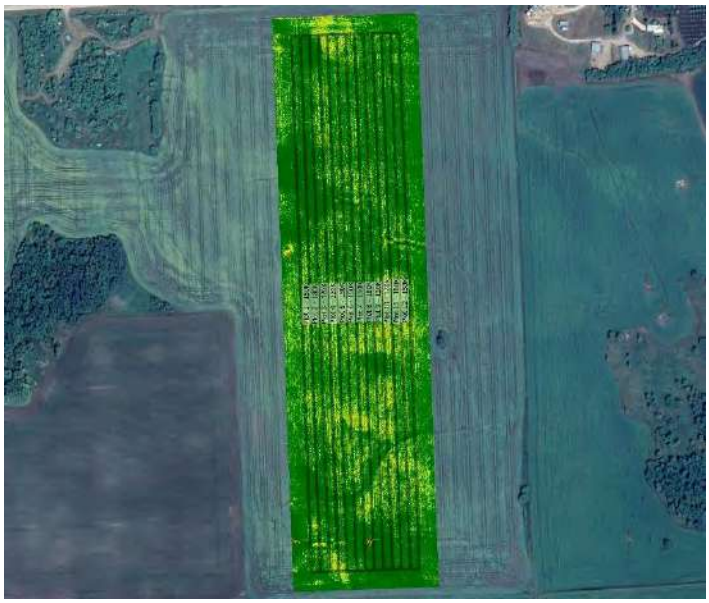
	Average dead seedlings (plants/ac)
120k	27,000
150k	46,000
180k	42,000

A killing frost hit before all the seedlings had emerged. Numbers reflect average dead seedlings/ac a few days following the frost event.

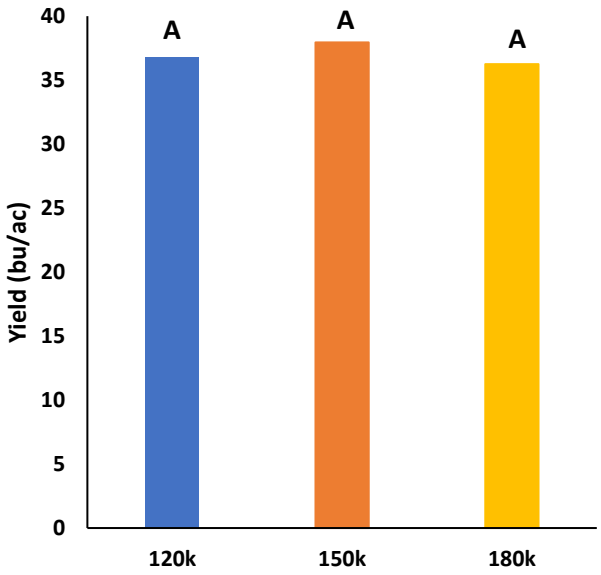
Plant Stand (plants/ac)

	V2	R8
120k	68,000	79,000
150k	91,000	96,000
180k	95,000	97,000

NDVI Field Image August 15



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
120k	36.8	$56/ac	
150k	38.0	$70/ac	-$14/ac
180k	36.3	$84/ac	-$28/ac
P-Value	0.5506	**Economic**	120k → 150k No
CV	8.3%		120k → 180k No
Significance	**No**		150k → 180k No

† Based on MB Agriculture 2021 Cost of Production Guidelines ($65.30/unit)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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Soybean Seeding Rate Trial

Trial ID: 2021-SSR04 – R.M. of Grey

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates

Summary: There was no significant yield difference between seeding rates of 120,000, 150,000 and 180,000 seeds/ac. As a result, there was a decrease in profit equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment	120k vs. 150k vs. 180k
Soil Texture	Clay
Previous Crop	Canola
Tillage	Conventional
Seeding Equipment	40 ft Planter
Seeding Date	May 11
Variety	DKB005-52
Germination	86%
Row Spacing	15″
Harvest Date	September 21

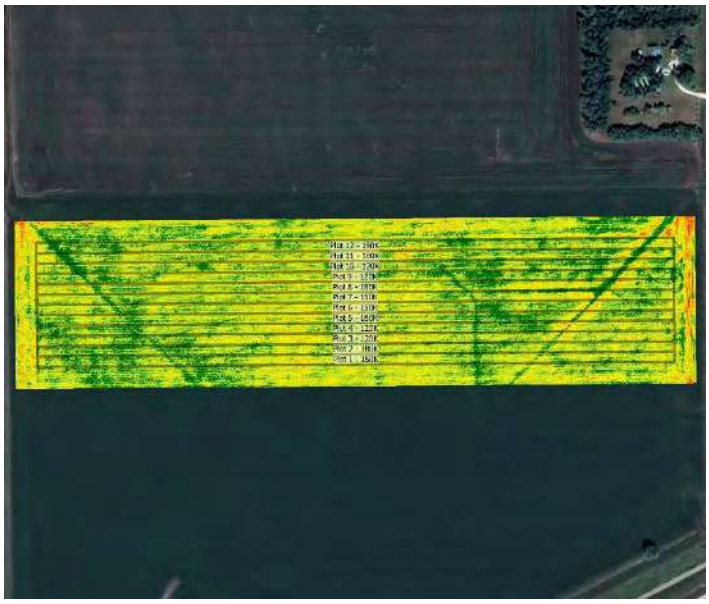
Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	49.5	70.7	25.3	64.3	209.8
Normal	53.8	80.6	65.7	71	271.1
% Normal	92%	88%	39%	91%	77%

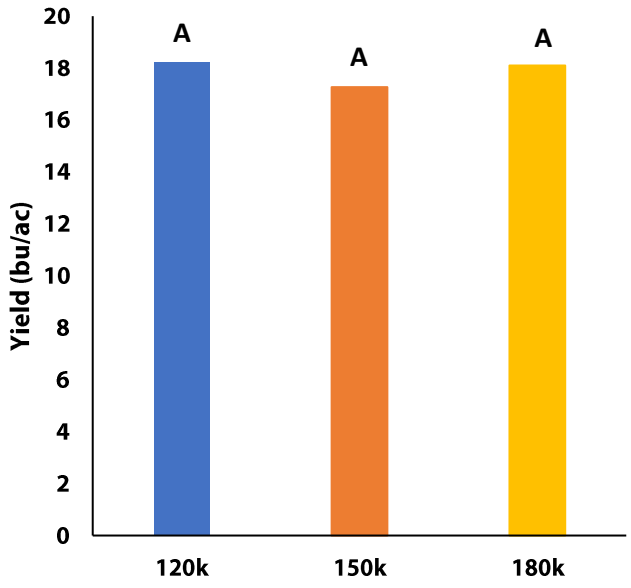
Plant Stand (plants/ac)

	V2	R6
120k	92,000	84,000
150k	119,000	110,000
180k	141,000	127,000

NDVI Field Image August 16



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
120k	18.2	$56/ac	
150k	17.3	$70/ac	-$14/ac
180k	18.1	$84/ac	-$28/ac
P-Value	0.6077	**Economic**	120k→ 150k No
CV	6.4%		120k→ 180k No
Significance	**No**		150k → 180k No

† Based on MB Agriculture 2021 Cost of Production Guidelines ($65.30/unit)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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Soybean Seeding Rate Trial

Trial ID: 2021-SSR05 – R.M. of St. Andrews

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates

Summary: There was no significant yield difference between seeding rates of 140,000, 170,000 and 200,000 seeds/ac. As a result, there was a decrease in profit equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment	140k vs. 170k vs. 200k
Soil Texture	Clay Loam
Previous Crop	Wheat
Tillage	Conventional
Seeding Equipment	60 ft Disc Drill
Seeding Date	May 12
Variety	P006A37X
Germination	84%
Row Spacing	10″
Harvest Date	September 24

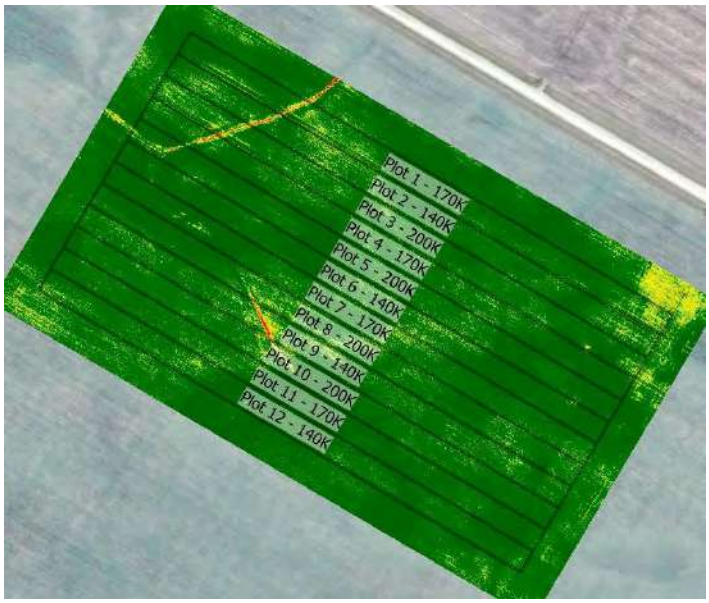
Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	22.2	45	24.2	88.2	179.6
Normal	54.4	90.7	81.1	73.7	299.9
% Normal	41%	50%	30%	120%	60%

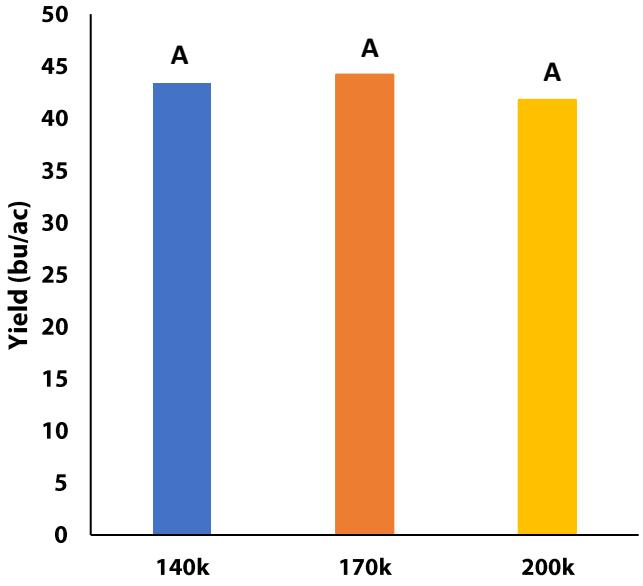
Plant Stand (plants/ac)

	V2	R8
140k	143,000	155,000
170k	170,000	183,000
200k	199,000	212,000

NDVI Field Image August 15



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
140k	43.3	$65/ac	
170k	44.2	$79/ac	-$14/ac
200k	41.8	$93/ac	-$28/ac
P-Value	0.4324	**Economic**	140k → 170k No
CV	7.4%		140k → 200k No
Significance	**No**		170k → 200k No

† Based on MB Agriculture 2021 Cost of Production Guidelines ($65.30/unit)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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Soybean Seeding Rate Trial

Trial ID: 2021-SSR06 – R.M. of Richot

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates

Summary: There was no significant yield difference between seeding rates of 108,000, 138,000 and 168,000 seeds/ac. As a result, there was a decrease in profit equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment	108k vs. 138k vs. 168k
Soil Texture	Clay
Previous Crop	Canola
Tillage	Conventional
Seeding Equipment	44 ft Planter
Seeding Date	May 12
Variety	S0009-M2
Germination	93%
Row Spacing	22″
Harvest Date	September 14

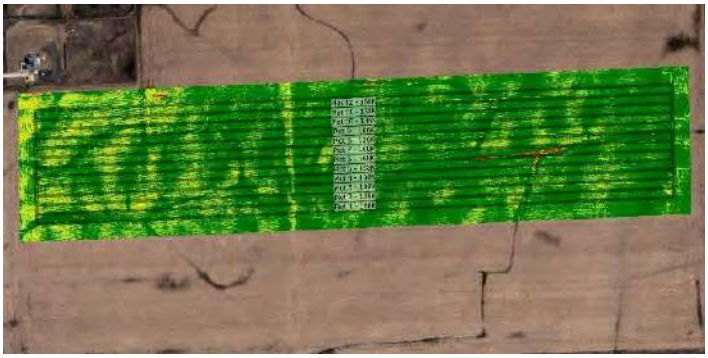
Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	17.8	60.2	9.2	94.8	182
Normal	57.5	88	69.5	75.8	290.8
% Normal	31%	68%	13%	125%	63%

Plant Stand (plants/ac)

	V1	R7
108k	95,000	86,000
138k	124,000	91,000
168k	155,000	112,000

NDVI Field Image August 14



Late Season Observations September 8

168k seeds/ac, smaller stems, less branching

138k seeds/ac, moderate stems, some branching

108k seeds/ac, thicker stems, more branching

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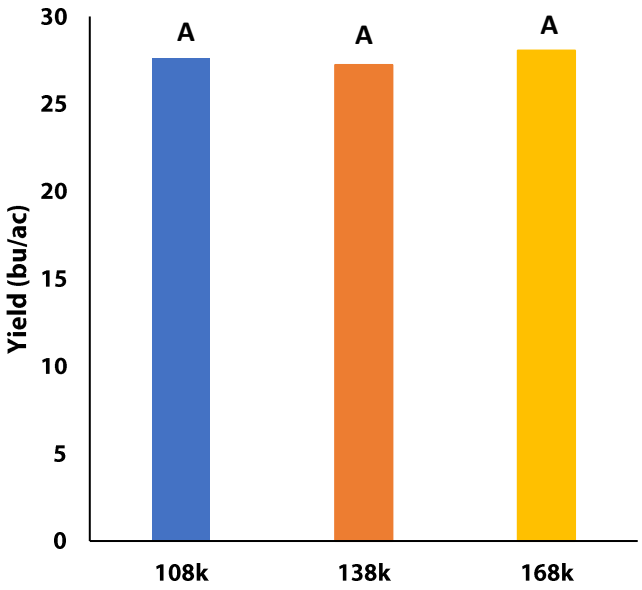
Yield by Treatment



Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
108k	27.6	$50/ac	
138k	27.2	$64/ac	-$14/ac
168k	28.1	$78/ac	-$28/ac
P-Value	0.465	**Economic**	108k → 138k No
CV	3.2%		108k → 168k No
Significance	**No**		138k → 168k No

† Based on MB Agriculture 2021 Cost of Production Guidelines ($65.30/unit)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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Soybean Seeding Rate Trial

Trial ID: 2021-SSR07 – R.M. of Glenella-Lansdowne

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates

Summary: There was no significant yield difference between seeding rates of 130,000, 160,000 and 190,000 seeds/ac. As a result, there was a decrease in profit equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment	130k vs. 160k vs. 190k
Soil Texture	Loamy Fine Sand
Previous Crop	Soybeans
Tillage	Conventional
Seeding Equipment	43 ft Disc Drill
Seeding Date	May 11
Variety	Kudo R2X
Germination	95%
Row Spacing	10″
Harvest Date	September 22

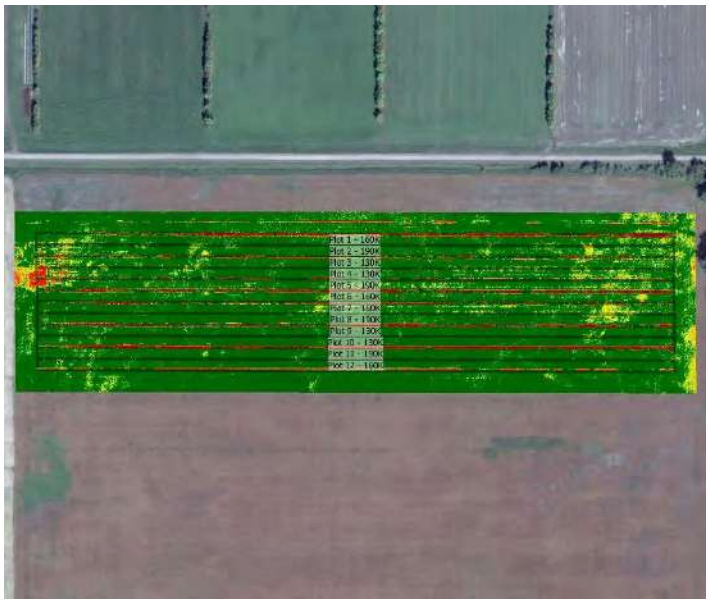
Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	15.1	38.8	28.5	142	224.5
Normal	49.7	76.9	61.7	64.3	252.6
% Normal	30%	50%	46%	221%	89%

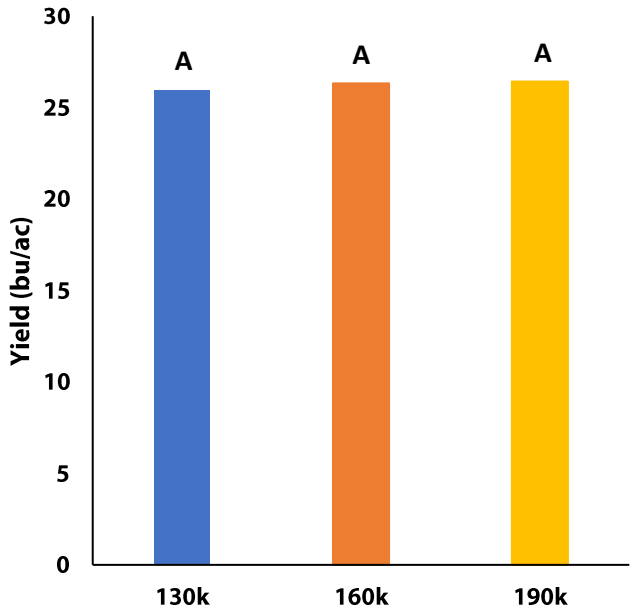
Plant Stand (plants/ac)

	V5	R7
130k	114,000	101,000
160k	143,000	136,000
190k	167,000	143,000

NDVI Field Image August 16



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
130k	26.0	$61/ac	
160k	26.3	$75/ac	-$14/ac
190k	26.4	$89/ac	-$28/ac
P-Value	0.9511	**Economic**	130k → 160k No
CV	12%		130k → 190k No
Significance	**No**		160k →190k No

† Based on MB Agriculture 2021 Cost of Production Guidelines ($65.30/unit)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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Soybean Seeding Rate Trial

Trial ID: 2021-SSR08 – R.M. of Ste. Anne

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates

Summary: There was no significant yield difference between seeding rates of 115,000, 145,000 and 175,000 seeds/ac. As a result, there was a decrease in profit equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment	115k vs. 145k vs. 175k
Soil Texture	Clay
Previous Crop	Corn
Tillage	Conventional
Seeding Equipment	44 ft Planter
Seeding Date	May 15
Variety	NSC Richer RR2Y
Germination	92%
Row Spacing	22"
Harvest Date	September 24

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	28.3	40.5	15.9	72.1	156.8
Normal	54	89.9	73.4	72.6	289.9
% Normal	52%	45%	22%	99%	54%

Plant Stand (plants/ac)

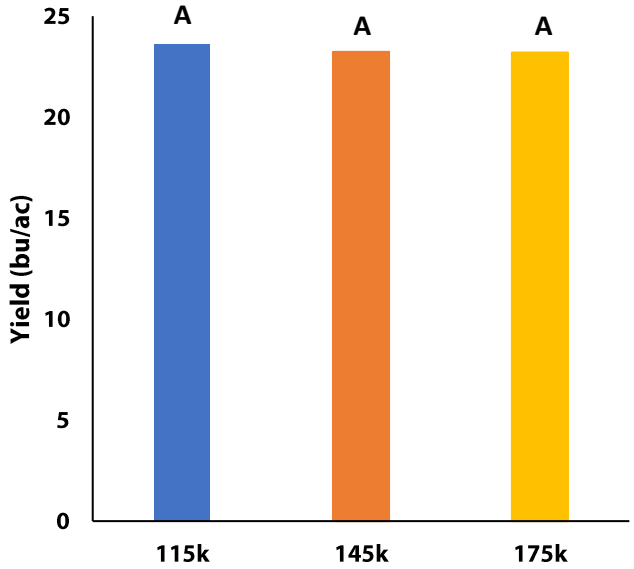
	V2	R6
115k	94,000	85,000
145k	122,000	109,000
175k	138,000	133,000

In-Season Observations August 4

Difference in branching between seeding rate treatments

NDVI Field Image August 13

Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
115k	23.6	$54/ac	
145k	23.2	$68/ac	-$14/ac
175k	23.2	$82/ac	-$28/ac
P-Value	0.8663	**Economic**	115k → 145k No
CV	4.1%		115k → 175k No
Significance	**No**		145k → 175k No

† Based on MB Agriculture 2021 Cost of Production Guidelines ($65.30/unit)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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Soybean Seeding Rate Trial

Trial ID: 2021-SSR09 – R.M. of Grey

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates

Summary: There was no significant yield difference between seeding rates of 122,000, 146,000 and 180,000 seeds/ac. However, there was high weed pressure at this site which contributed to higher than normal variability in yield data. As a result, there was a decrease in profit equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment	122k vs. 146k vs. 180k
Soil Texture	Loamy Very Fine Sand
Previous Crop	Corn
Tillage	Conventional
Seeding Equipment	43 ft Air Drill
Seeding Date	May 15
Variety	S007-A2XS
Germination	84%
Row Spacing	10"
Harvest Date	October 7

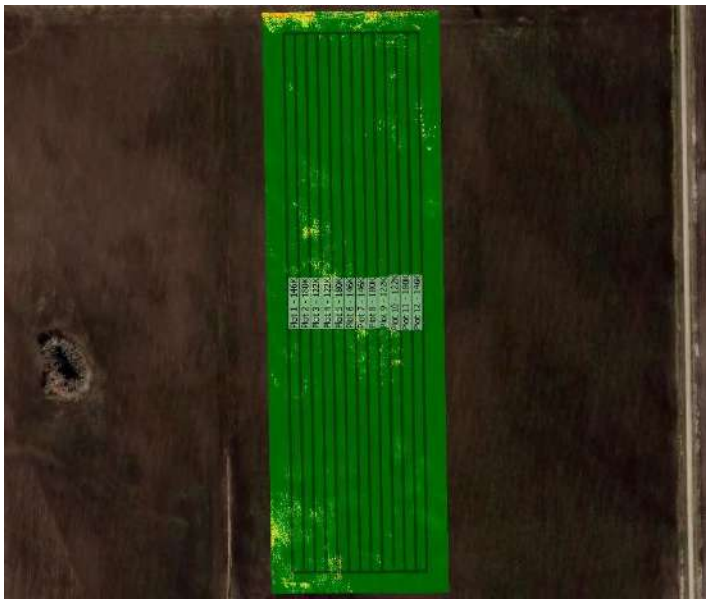
Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	49.5	70.7	25.3	64.3	209.8
Normal	53.8	80.6	65.7	71	271.1
% Normal	92%	88%	39%	91%	77%

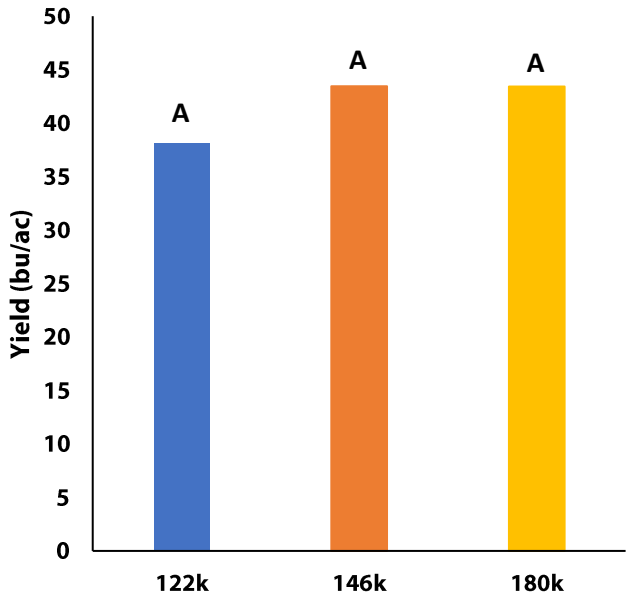
Plant Stand (plants/ac)

	V2	R8
122k	106,000	107,000
146k	118,000	119,000
180k	172,000	167,000

NDVI Field Image August 16



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
122k	38.1	$57/ac	
146k	43.5	$68/ac	-$11/ac
180k	43.4	$84/ac	-$27/ac
P-Value	0.0563	**Economic**	122k → 146k No
CV	12%		122k → 180k No
Significance	**No**		146k → 180k No

† Based on MB Agriculture 2020 Cost of Production Guidelines ($65.30/unit)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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Soybean Seeding Rate Trial

Trial ID: 2021-SSR10 – R.M. of Westlake-Gladstone

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates

Summary: There was no significant yield difference between seeding rates of 120,000, 150,000 and 180,000 seeds/ac. As a result, there was a decrease in profit equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment	120k vs. 150k vs. 180k
Soil Texture	Fine Sandy Loam
Previous Crop	Canola
Tillage	Conventional
Seeding Equipment	60 ft Planter
Seeding Date	May 15
Variety	P005A83X
Germination	89%
Row Spacing	30"
Harvest Date	September 29

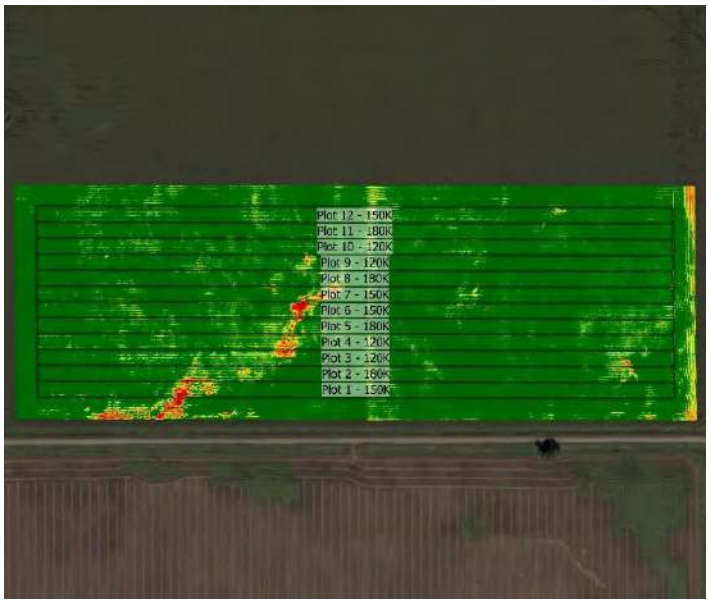
Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	35.3	48.3	8.9	119	211.5
Normal	52.7	70.5	73.5	67.7	264.4
% Normal	67%	69%	12%	176%	80%

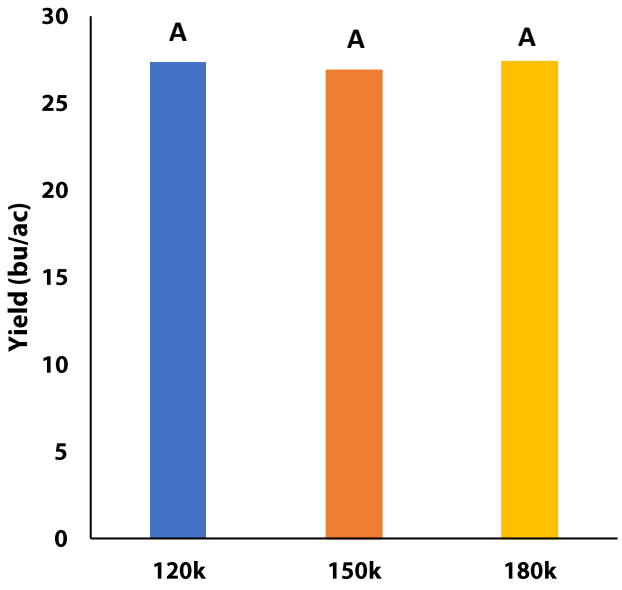
Plant Stand (plants/ac)

	V2	R8
120k	98,000	104,000
150k	130,000	117,000
180k	155,000	129,000

NDVI Field Image August 16



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
120k	27.4	$56/ac	
150k	26.9	$70/ac	-$14/ac
180k	27.4	$84/ac	-$28/ac
P-Value	0.9604	**Economic**	120k → 150k No
CV	13%		120k → 180k No
Significance	**No**		150k → 180k No

† Based on MB Agriculture 2021 Cost of Production Guidelines ($65.30/unit)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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Soybean Seeding Rate Trial

Trial ID: 2021-SSR11 – R.M. of St. Andrews

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates

Summary: There was no significant yield difference between seeding rates of 125,000, 155,000 and 185,000 seeds/ac. As a result, there was a decrease in profit equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment	125k vs. 155k vs. 185k
Soil Texture	Clay
Previous Crop	Wheat
Tillage	Conventional
Seeding Equipment	60 ft Disc Drill
Seeding Date	May 15
Variety	P006A37X
Row Spacing	10"
Harvest Date	October 4

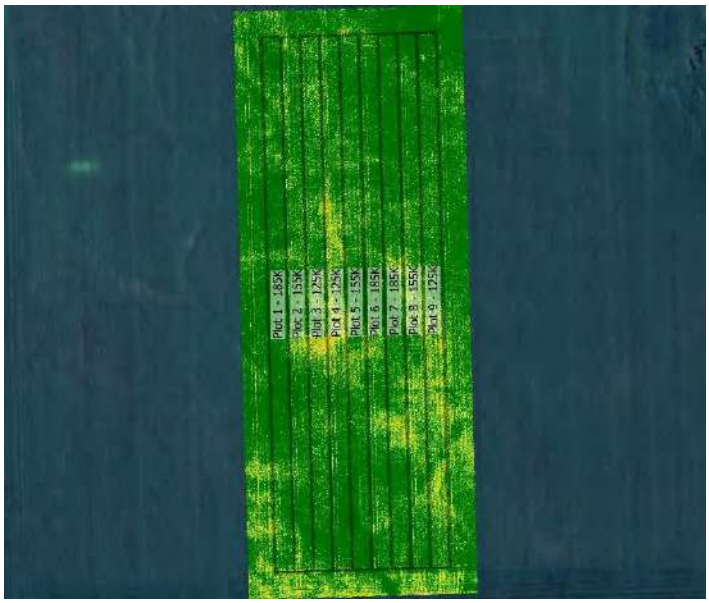
Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	39.2	32.7	25.7	86.8	184.4
Normal	53.8	92	66.4	63.3	275.5
% Normal	73%	36%	39%	137%	67%

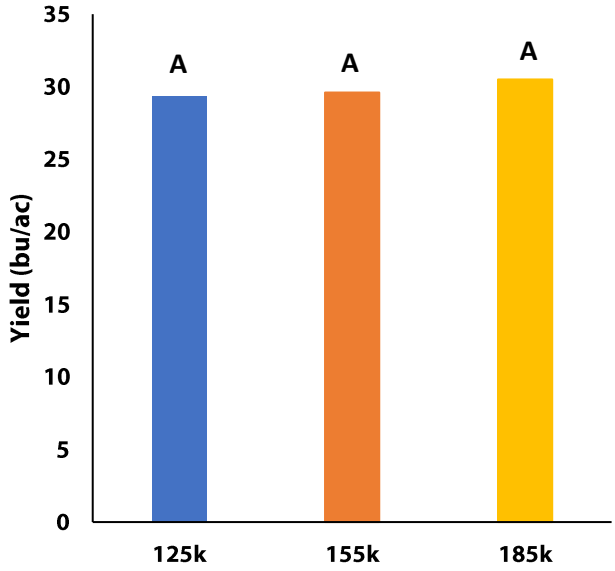
Plant Stand (plants/ac)

	V2	R7
125k	90,000	79,000
155k	142,000	103,000
185k	121,000	103,000

NDVI Field Image August 15



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
125k	29.4	$58/ac	
155k	29.6	$72/ac	-$14/ac
185k	30.5	$86/ac	-$28/ac
P-Value	0.3792	**Economic**	125k → 155k No
CV	3.2%		125k → 185k No
Significance	**No**		155k → 185k No

† Based on MB Agriculture 2021 Cost of Production Guidelines ($65.30/unit)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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Soybean Seeding Rate Trial

Trial ID: 2021-SSR12 – R.M. of Grassland

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates

Summary: There was no significant yield difference between seeding rates of 125,000, 155,000 and 185,000 seeds/ac. As a result, there was a decrease in profit equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment	125k vs. 155k vs. 185k
Soil Texture	Loam / Clay Loam
Previous Crop	Corn
Tillage	Conventional
Seeding Equipment	60 ft Planter
Seeding Date	May 18
Variety	S0009-F2X
Germination	96%
Row Spacing	15″
Harvest Date	September 25

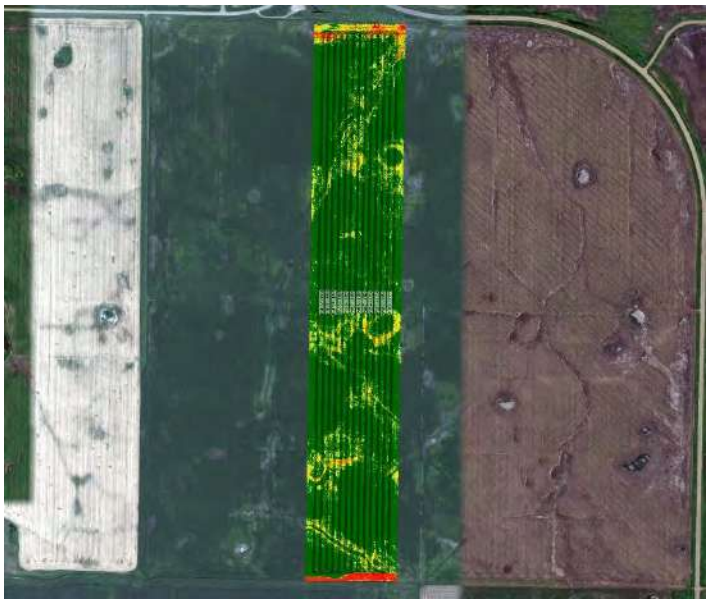
Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	29.2	95	21.5	155	300.6
Normal	46.9	83.7	65.2	57.6	253.4
% Normal	62%	114%	33%	269%	119%

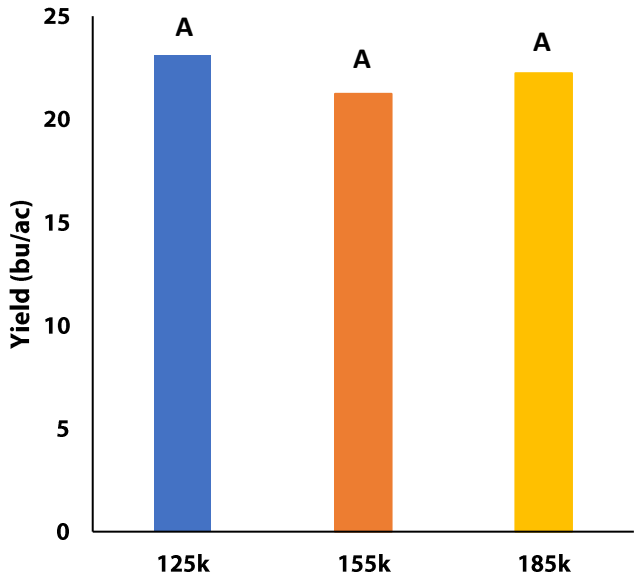
Plant Stand (plants/ac)

	V2	R6
125k	110,000	103,000
155k	128,000	125,000
185k	157,000	166,000

NDVI Field Image August 13



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
125k	23.1	$58/ac	
155k	21.2	$72/ac	-$14/ac
185k	22.2	$86/ac	-$28/ac
P-Value	0.4621	**Economic**	125k → 155k No
CV	7.5%		125k → 185k No
			155k → 185k No
Significance	**No**		

† Based on MB Agriculture 2021 Cost of Production Guidelines ($65.30/unit)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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Soybean Seeding Rate Trial

Trial ID: 2021-SSR13 – R.M. of Grassland

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates

Summary: There was no significant yield difference between seeding rates of 130,000, 160,000 and 190,000 seeds/ac. As a result, there was a decrease in profit equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment	130k vs. 160k vs. 190k
Soil Texture	Loam
Previous Crop	Peas
Tillage	Zero Till
Seeding Equipment	50 ft Air Drill
Seeding Date	May 19
Variety	Merritt R2X
Germination	84%
Row Spacing	12″
Harvest Date	September 25

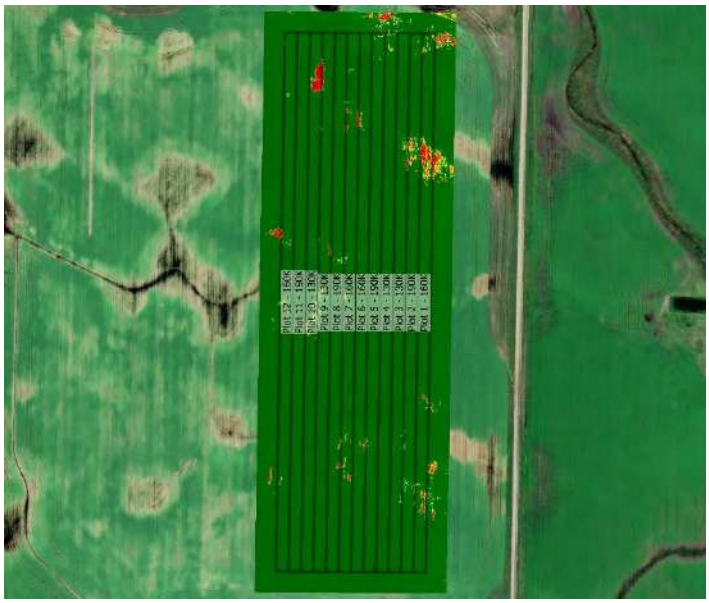
Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	31.6	91.4	31.7	133	287.9
Normal	46.9	83.7	65.2	57.6	253.4
% Normal	67%	109%	49%	231%	114%

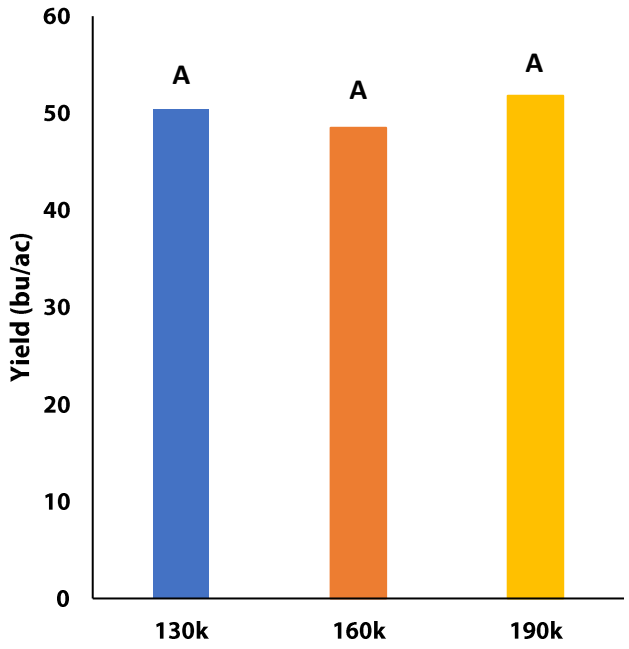
Plant Stand (plants/ac)

	V2	R6
130k	112,000	109,000
160k	132,000	126,000
190k	154,000	145,000

NDVI Field Image August 13



Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
130k	50.5	$61/ac	
160k	48.5	$75/ac	-$14/ac
190k	51.8	$89/ac	-$28/ac
P-Value	0.5249	**Economic**	130k → 160k No
CV	8.5%		130k → 190k No
Significance	**No**		160k → 190k No

† Based on MB Agriculture 2021 Cost of Production Guidelines ($65.30/unit)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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Soybean Seeding Rate Trial

Trial ID: 2021-SSR14 – R.M. of Brokenhead

Objective: Quantify the agronomic and economic impacts of different soybean seeding rates

Summary: There was no significant yield difference between seeding rates of 168,000, 210,000 and 252,000 seeds/ac. As a result, there was a decrease in profit equivalent to the increase in seed cost for the higher seeding rates.

Trial Information

Treatment	168k vs. 210k vs. 252k
Soil Texture	Fibric
Previous Crop	Corn
Tillage	Conventional
Seeding Equipment	48 ft Air Drill
Seeding Date	June 4
Variety	OAC Prudence
Germination	68%
Row Spacing	9″
Harvest Date	October 26

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	51.6	25.8	27.8	87	192.2
Normal	54	89.9	73.4	72.6	289.9
% Normal	96%	29%	38%	120%	66%

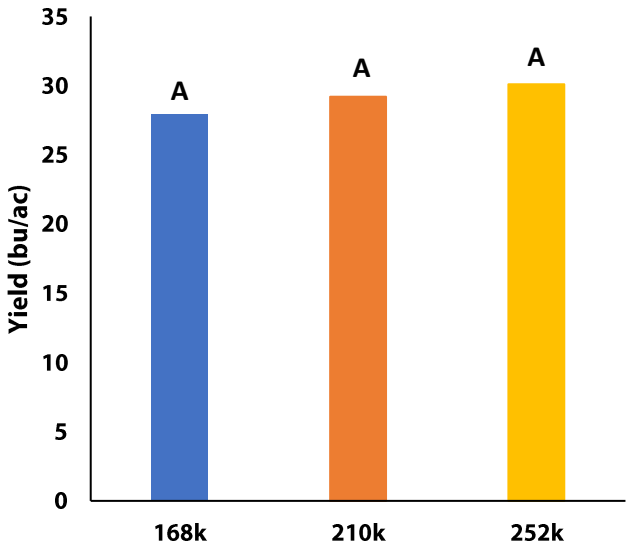
Plant Stand (plants/ac)

	V2	R7
168k	64,000	62,000
210k	84,000	68,000
252k	79,000	66,000

Germination was low for the seed at this trial (68%). This, plus weed pressure throughout the season, likely contributed to the low plant stands.

NDVI Field Image August 15

Yield by Treatment



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Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
168k	27.9	$78/ac	
210k	29.2	$98/ac	-$20/ac
252k	30.1	$118/ac	-$39/ac
P-Value	0.2892	**Economic**	168k → 210k No
CV	6.7%		168k → 252k No
Significance	**No**		210k → 252k No

† Based on MB Agriculture 2021 Cost of Production Guidelines ($65.30/unit)

†† Change in profit is calculated as the difference in cost between seeding rate treatments. Because yields were not significantly different, there is no increased income to offset the increase in seed cost

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NOTES

Soybean Row Spacing Trials

Objective: Quantify the agronomic and economic impacts of different row spacings in soybeans.

Summary: Row spacing generally did not have a significant effect on yield in the 2021 trials, except at SRS01. However, this trial had substantial drought stress and late season grasshopper pressure.

Summary of 2021 soybean row spacing trial yield results by site-year.

Trial ID	Rural Municipality	Row Spacings		Seeding Rate	Plant Stand @ Midseason		Yield		Yield Difference	CV	P-Value	Statistically Significant @ 95%
		Narrow	Wide		Narrow	Wide	Narrow	Wide				
		Inch		000 seeds/ac	'000/ac		bu/ac		bu/ac	%		
ǂ SRS01	Morris	7.5	15	130 vs 180 ǂ	82	74	14	16.3	2.3	9.7	0.0166	**Yes**
SRS02	Louise	7.5	15	190	185	114	51.7	51.1	0.6	1.4	0.1027	**No**
SRS03	La Broquerie	15	30	155	121	120	39.8	39.5	0.3	8.3	0.8893	**No**
SRS04	Rockwood	15	30	160	127	72	18.1	18.8	-0.7	5.1	0.3415	**No**
SRS05	Louise	7.5	15	166	131	148	36.6	36.7	-0.1	3.9	0.8973	**No**

ǂ SRS01 treatment detailed seeding rates 7.5" @ 130K aeeds/ac and 15" @ 180k seeds/ac

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Soybean Row Spacing Trial

Trial ID: 2021-SRS01 – R.M. of Morris

Objective: Quantify the agronomic and economic impacts of different row spacings, and accompanying seeding rates, on soybean production

Summary: At R1, canopy closure in the 7.5" spacing was significantly greater than in the 15" spacing. At R3 and R5, canopy closure was statistically the same between the two spacings. The 15" row spacing yielded significantly more than the 7.5" spacing; however, yield potential was limited by drought stress, and grasshopper pressure was a problem throughout the latter portion of the season at this trial.

Trial Information

Treatment	7.5" @ 130K seeds/ac vs. 15" @ 180K seeds/ac
Soil Texture	Clay
Previous Crop	Wheat
Tillage	Conventional
Seeding Equipment	60 ft Disc Drill
Seeding Date	May 7
Variety	DKB003-29
Harvest Date	September 25

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	60.1	55.8	31.8	90.1	237.8
Normal	53.6	86.4	71.9	65.4	277.3
% Normal	112%	65%	44%	138%	86%

Plant Stand (plants/ac)

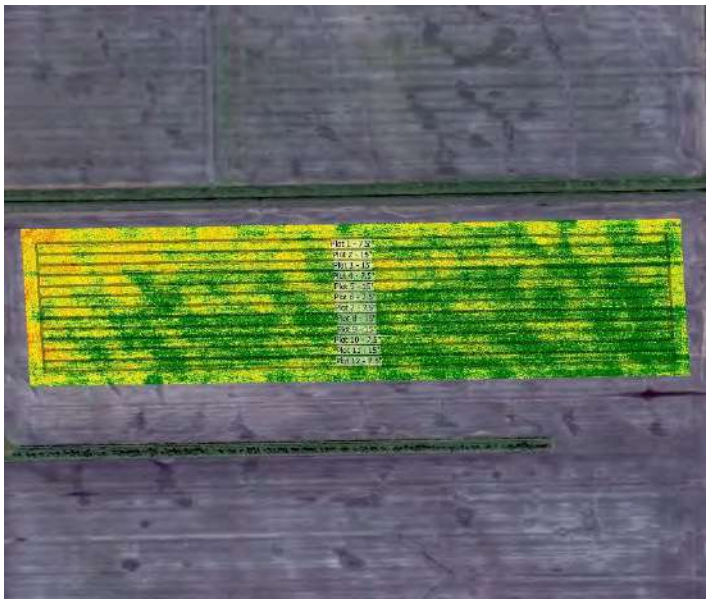
	V1	R7
7.5" @ 130K	88,000	82,000
15" @ 180K	82,000	74,000

% Canopy Closure†

	R1	R3	R5
7.5" @ 130K	21% A	53% A	67% A
15" @ 180K	17% B	52% A	66% A

† Closure percentages in columns followed by different letters are significantly different from one another; Measurements taken using the Canopeo iPhone app

NDVI Field Image August 16



Canopy Closure Images

Canopeo app measurements of 7.5" row spacing canopy closure at R1 (left) and R5 (right).

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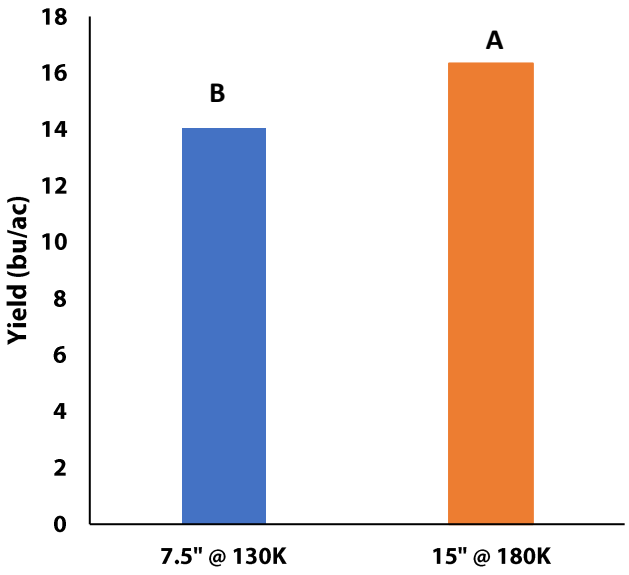
Yield by Treatment



Typically, if there is a significant yield difference, we would expect to see an increase with narrower spacing. However, at this trial the opposite took place. There are likely some confounding factors, with drought stress and grasshopper pressure throughout the season at this trial. While it seems logical that the 15" spacing could have yielded more than the 7.5" spacing as a result of the increase in seeding rate, there wasn't an associated increase in plant stand according to our measurements.

Investigating this question in a year with more favourable production conditions would be valuable.

Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††	
			Long-Term Average ($11-12/bu)	Current Conditions ($13-15/bu)
7.5" @ 130K	14.0	$61/ac	$2 to $4/ac	$7 to $11/ac
15" @ 180K	16.3	$84/ac		
Yield Difference	2.3			
P-Value	0.0166			
CV	9.7%			
Significance	**Yes**	**Economic**	**Yes**	**Yes**

† Does not account for any equipment/operating cost differences between spacings; seed cost based on MB Agriculture Cost of Production Guidelines

†† Change in profit/ac is the difference between the change in income/ac from a significant difference in yield, and the change in cost/ac with the increase in seeding rate. Profit/ac is presented as a range across long-term average soybean prices and those more similar to current market conditions.

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Soybean Row Spacing Trial

Trial ID: 2021-SRS02 – R.M. of Louise

Objective: Quantify the agronomic and economic impacts of different row spacings on soybean production

Summary: There was no significant yield difference between 7.5″ and 15″ spacing. Canopy closure was significantly greater in the 15″ treatment at R1, however by R5 the 7.5″ treatment had statistically significantly greater canopy closure. Agronomically, canopy closure was quite similar between row spacings as the season progressed.

Trial Information

Treatment	7.5″ vs. 15″
Soil Texture	Clay Loam
Previous Crop	Wheat
Tillage	Conventional
Seeding Equipment	42 ft Disc Drill
Seeding Date	May 12
Variety	P001A48X
Seeding Rate	190 000 seeds/ac
Harvest Date	September 23

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	27.4	105	38.4	66.8	237.6
Normal	61.1	89.8	68.3	72.3	291.5
% Normal	45%	117%	56%	92%	82%

Plant Stand (plants/ac)

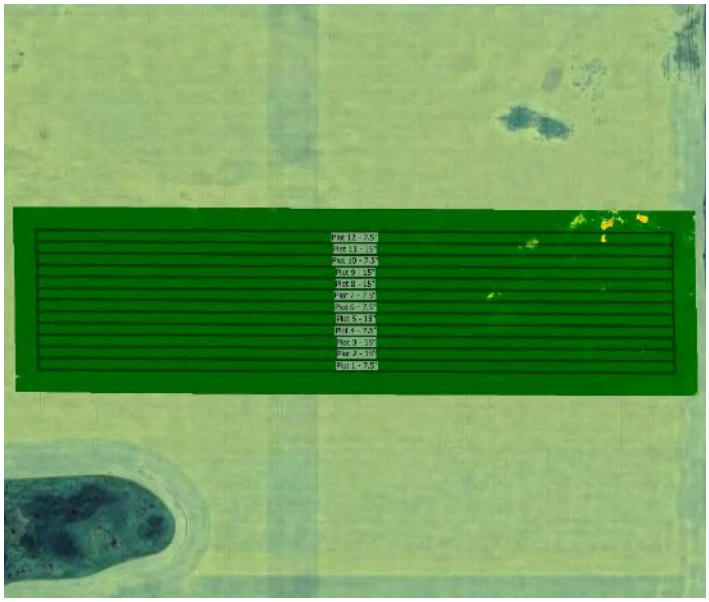
	V6	R8
7.5″	186,000	185,000
15″	145,000	114,000

% Canopy Closure†

	R1	R3	R5
7.5″	70% B	83% A	93% A
15″	74% A	83% A	92% B

† Closure percentages in columns followed by different letters are significantly different from one another; Measurements taken using the Canopeo iPhone app

NDVI Field Image August 13



Canopy Closure Images

Canopeo app measurements of 7.5″ row spacing canopy closure at R5 (left) and corresponding true colour image (right).

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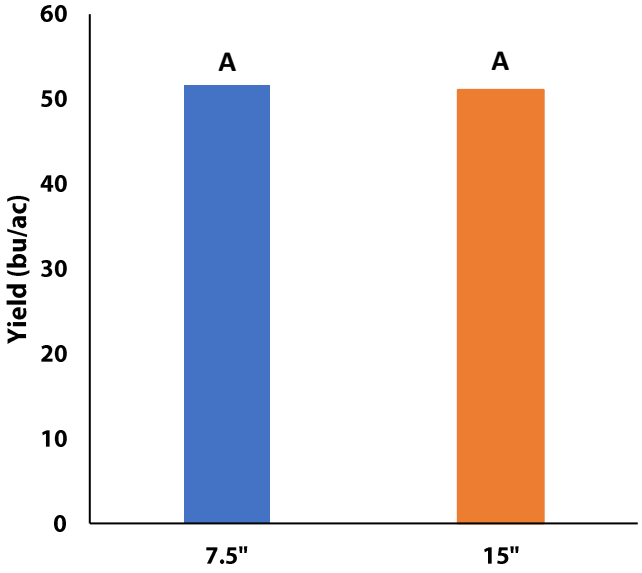
Yield by Treatment



Overall Yield & Economics

	Mean (bu/ac)	Change in Profit/ac†
7.5"	51.7	n/a
15"	51.1	n/a
Yield Difference	0.6	
P-Value	0.1027	
CV	1.4%	
Significance	**No**	**Economic n/a**

† Does not account for any equipment/operating cost differences between spacings

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Soybean Row Spacing Trial

Trial ID: 2021-SRS03 – R.M. of La Broquerie

Objective: Quantify the agronomic and economic impacts of different row spacings on soybean production

Summary: There was no significant yield difference between soybeans at 15 and 30" spacing. The canopy in the 15" spacing treatment began to close earlier than the 30" spacing treatment. By the end of the season, agronomically, canopy closure was quite similar between row spacing treatments.

Trial Information

Treatment	15" vs. 30"
Soil Texture	Loamy Fine Sand
Previous Crop	Corn
Tillage	Conventional
Seeding Equipment	40 ft Planter
Seeding Date	May 13
Variety	TH 88007R2X
Seeding Rate	155 000 seeds/ac
Harvest Date	September 27

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	77.2	65	33	84.9	260.1
Normal	58.1	91.3	80.1	66.1	295.6
% Normal	133%	71%	41%	128%	88%

Plant Stand (plants/ac)

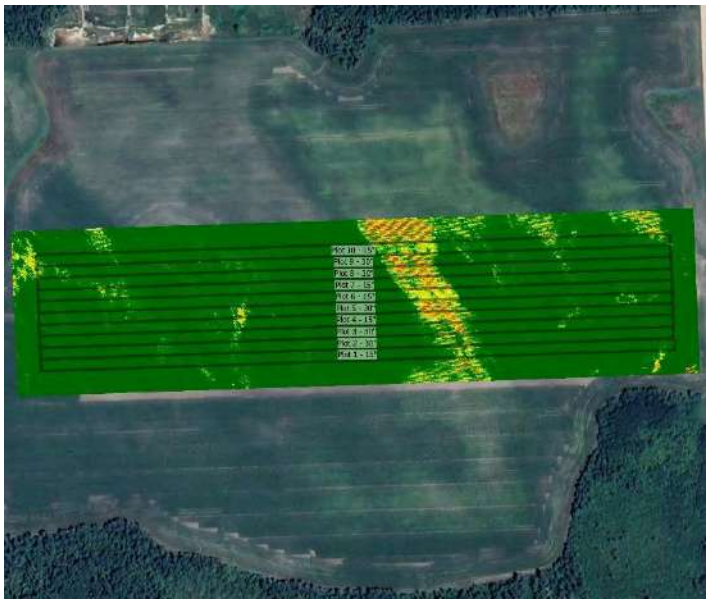
	V2	R6
15"	122,000	121,000
30"	128,000	120,000

% Canopy Closure†

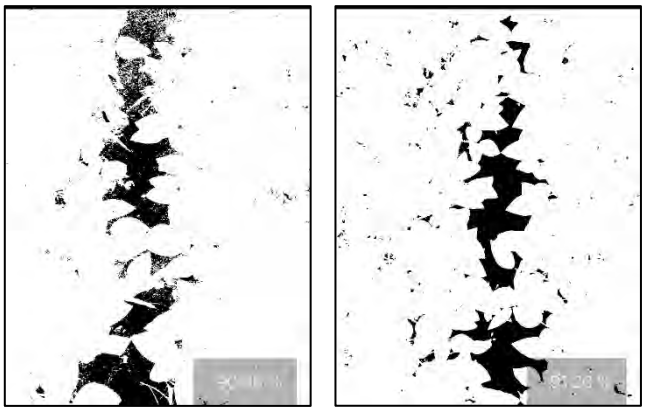
	R1	R3	R5
15"	62% A	80% A	88% B
30"	50% B	81% A	91% A

† Closure percentages in columns followed by different letters are significantly different from one another

NDVI Field Image August 14



Canopy Closure Images



Canopeo app measurements, at R5, of 15" row spacing canopy closure (left) and 30" row spacing canopy closure (right).

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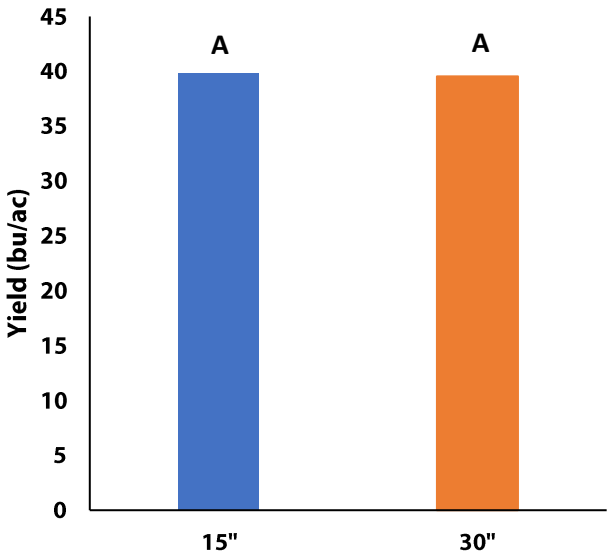
Yield by Treatment



Overall Yield & Economics

	Mean (bu/ac)	Change in Profit/ac†
15"	39.8	n/a
30"	39.5	n/a
Yield Difference	0.3	
P-Value	0.8893	
CV	8.3%	
Significance	**No**	**Economic n/a**

† Does not account for any equipment/operating cost differences between spacings

†

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Soybean Row Spacing Trial

Trial ID: 2021-SRS04 – R.M. of Rockwood

Objective: Quantify the agronomic and economic impacts of different row spacings on soybean production

Summary: There was no significant yield difference between soybeans planted on 15 and 30" spacing. Canopy closure was statistically similar at R1 and R3, however at R5, the 15" spacing canopy was significantly more closed than the 30" spacing strips.

Trial Information

Treatment	15" vs. 30"
Soil Texture	Clay Loam
Previous Crop	Corn
Tillage	Conventional
Seeding Equipment	40 ft Planter
Seeding Date	May 21
Variety	Akras R2
Seeding Rate	160 000 seeds/ac
Harvest Date	October 25

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	39.2	32.7	25.7	86.8	184.4
Normal	53.8	92	66.4	63.3	275.5
% Normal	73%	36%	39%	137%	67%

Plant Stand (plants/ac)

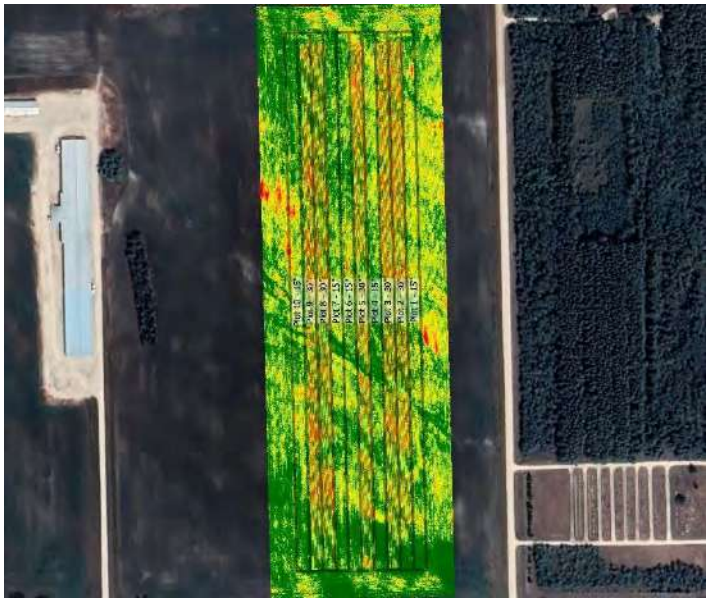
	V2	R7
15"	129,000	127,000
30"	72,000	72,000

% Canopy Closure†

	R1	R3	R5
15"	24% A	45% A	68% A
30"	24% A	44% A	61% B

† Closure percentages in columns followed by different letters are significantly different from one another

NDVI Field Image August 15



Canopy Closure Images

Canopeo app measurements of 15" row spacing canopy closure at R3 (left) and corresponding true colour image (right).

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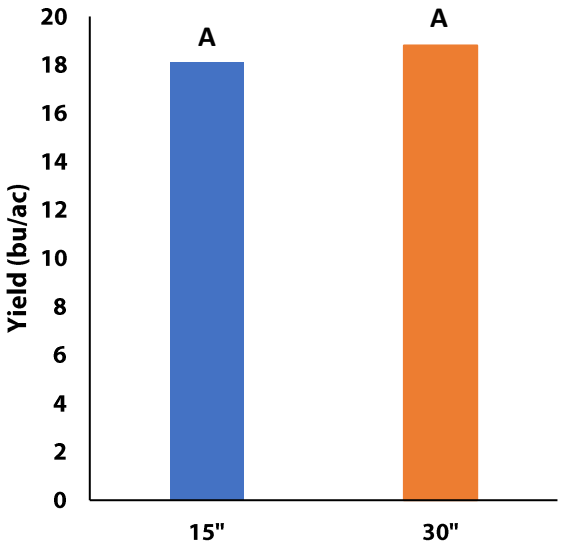
Yield by Treatment



Overall Yield & Economics

	Mean (bu/ac)	Change in Profit/ac†
15"	18.1	n/a
30"	18.8	n/a
Yield Difference	-.07	
P-Value	0.3415	
CV	5.1%	
Significance	**No**	**Economic n/a**

† Does not account for any equipment/operating cost differences between spacings

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Soybean Row Spacing Trial

Trial ID: 2021-SRS05 – R.M. of Louise

Objective: Quantify the agronomic and economic impacts of different row spacings on soybean production

Summary: There was no significant yield difference between soybeans at 7.5 and 15" row spacing. By the end of the season, canopy closure was statistically similar for the two row spacing treatments.

Trial Information

Treatment	7.5" vs. 15"
Soil Texture	Clay Loam
Previous Crop	Barley
Tillage	Zero Till
Seeding Equipment	30 ft Disc Drill
Seeding Date	May 26
Seeding Rate	166 000
Harvest Date	September 26

Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	33.6	93.4	13.3	61.1	201.4
Normal	61.1	89.8	68.3	72.3	291.5
% Normal	55%	104%	19%	85%	69%

Plant Stand (plants/ac)

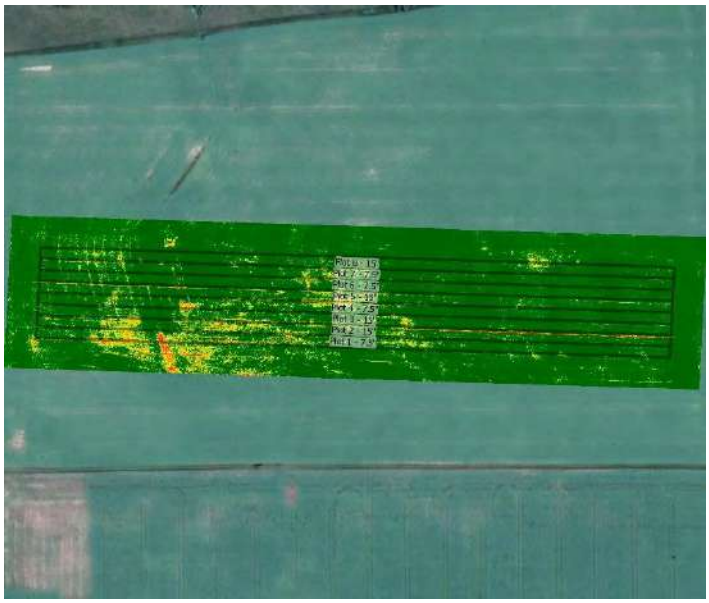
	V1	R7
7.5"	131,000	131,000
15"	122,000	148,000

% Canopy Closure†

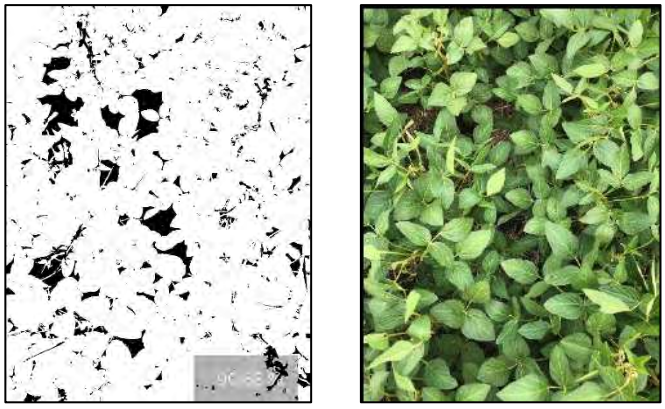
	R1	R3	R5
7.5"	21% B	57% B	91% A
15"	23% A	68% A	88% A

† Closure percentages in columns followed by different letters are significantly different from one another

NDVI Field Image August 13



Canopy Closure Images



Canopeo app measurements of 7.5" row spacing canopy closure at R5 (left) and corresponding true colour image (right).

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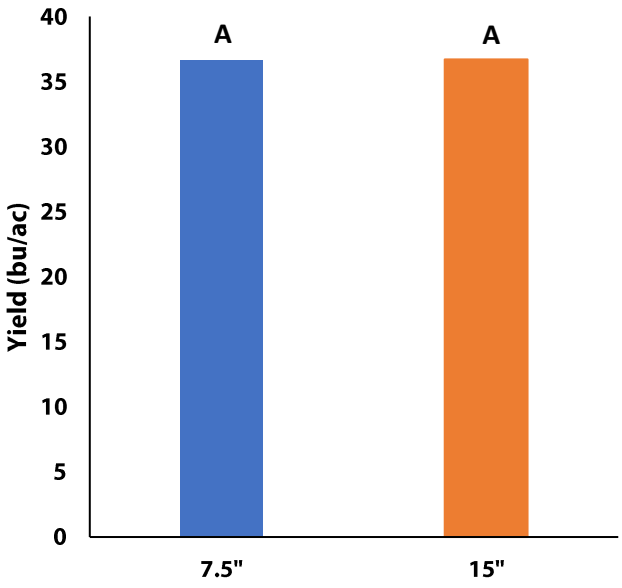
Yield by Treatment



Overall Yield & Economics

	Mean (bu/ac)	Change in Profit/ac‡	
7.5"	36.6	n/a	
15"	36.7	n/a	
Yield Difference	-0.1		
P-Value	0.8973		
CV	3.9%		
Significance	**No**	**Economic**	**n/a**

‡ Does not account for any equipment/operating cost differences between spacings

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NOTES

Soybean Biological Trials

Objective: Quantify the agronomic and economic impacts of biological products in soybeans.

Summary: There was no significant yield difference between untreated soybeans and soybeans treated with OHM or Primacy Alpha.

Summary of 2021 soybean biological trial yield results, by site-year

Trial ID	Rural Municipality	Application Timing	Product	Yield		Yield Difference	CV	P-Value	Statistically Significant @ 95%
				Treated	Untreated				
				bu/ac		bu/ac	%		
SB01	Woodlands	V3	OHM®	19.7	19.4	0.3	2.1	0.4522	**No**
SB03	De Salaberry	R1	OHM®	51.2	51.7	-0.5	8.3	0.5156	**No**
SB04	St. Clements	R1	Primacy Alpha®	42	41.6	0.4	2.2	0.4889	**No**
SB05	Morris	V4	OHM®	41.4	42.3	-0.9	3.0	0.1078	**No**

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Soybean Biological Trial

Trial ID: 2021-SB01 – R.M. of Woodlands

Objective: Quantify the agronomic and economic impacts of biological products for soybean production

Summary: There was no significant yield difference between soybeans treated with OHM®and those without. Due to the lack of yield response, there was a decrease in profit/ac in the treated area of the trial, equivalent to the cost of product application.

Trial Information

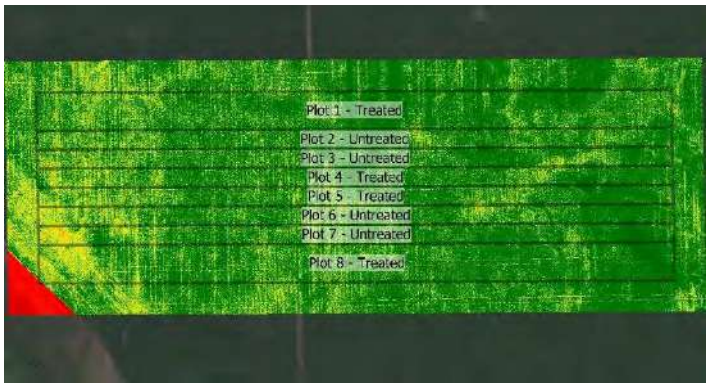
Treatment†	OHM®
Application Timing	V3
Application Date	June 22
Application Rate	200 ml/ac
Application Method	Foliar Spray
Soil Texture	Clay
Previous Crop	Oats
Tillage	Conventional
Seeding Date	May 17
Variety	Bourke R2X
Seeding Rate	210 000 seeds/ac
Row Spacing	10″
Plant Stand @ R3	141 000 plants/ac
Harvest Date	September 21

† OHM® is a biological product intended to optimize nutrient use efficiency

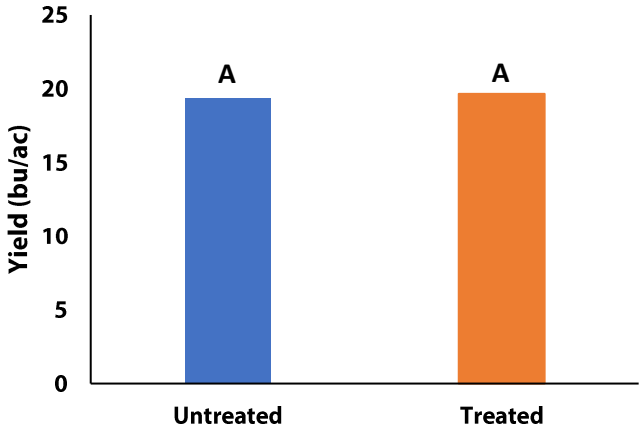
Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	36.4	45.7	12	79.5	173.6
Normal	53.8	92	66.4	63.3	275.5
% Normal	68%	50%	18%	126%	63%

NDVI Field Image August 15



Yield by Treatment



Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Treated	19.7	$7/ac	-$7/ac
Untreated	19.4		
Yield Difference	0.3		
P-Value	0.4522		
CV	2.1%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for biological products

†† Yields were not significantly different, therefore there is no increased income to offset the cost of the biological product

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Soybean Biological Trial

Trial ID: 2021-SB03 – R.M. of Morris

Objective: Quantify the agronomic and economic impacts of biological products for soybean production

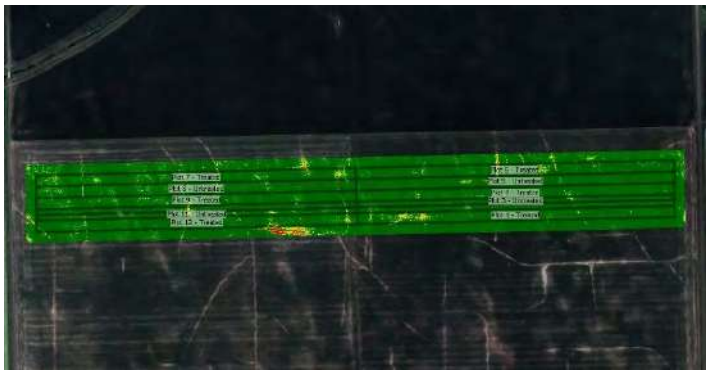
Summary: There was no significant yield difference between soybeans treated with OHM®and those without. Due to the lack of yield response, there was a decrease in profit/ac in the treated area of the trial, equivalent to the cost of product application.

Trial Information

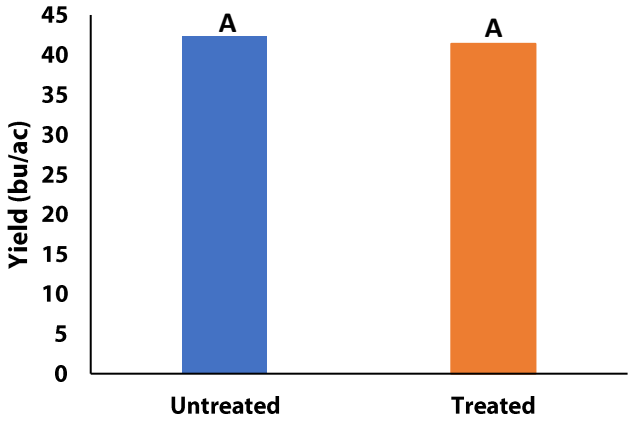
Treatment†	OHM®
Application Timing	V4
Application Date	June 29
Application Rate	200 ml/ac
Application Method	Foliar Spray
Soil Texture	Clay
Previous Crop	Wheat
Tillage	Conventional
Seeding Date	May13
Variety	TH 88007R2X
Seeding Rate	180 000 seeds/ac
Row Spacing	9″
Plant Stand @ R6	120 000 plants/ac
Harvest Date	September 22

† OHM® is a biological product intended to optimize nutrient use efficiency

NDVI Field Image August 14



Yield by Treatment



Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	38.6	49.6	18.7	107	213.5
Normal	53.6	86.4	71.9	65.4	277.3
% Normal	72%	57%	26%	163%	77%

Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Treated	41.4	$7/ac	-$7/ac
Untreated	42.3		
Yield Difference	-0.9		
P-Value	0.1078		
CV	3.0%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for biological products

†† Yields were not significantly different, therefore there is no increased income to offset the cost of the biological product

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Soybean Biological Trial

Trial ID: 2021-SB04 – R.M. of St. Clements

Objective: Quantify the agronomic and economic impacts of biological products for soybean production

Summary: There was no significant yield difference between soybeans treated with Primacy Alpha and those without. Due to the lack of yield response, there was a decrease in profit/ac in the treated area of the trial, equivalent to the cost of product application.

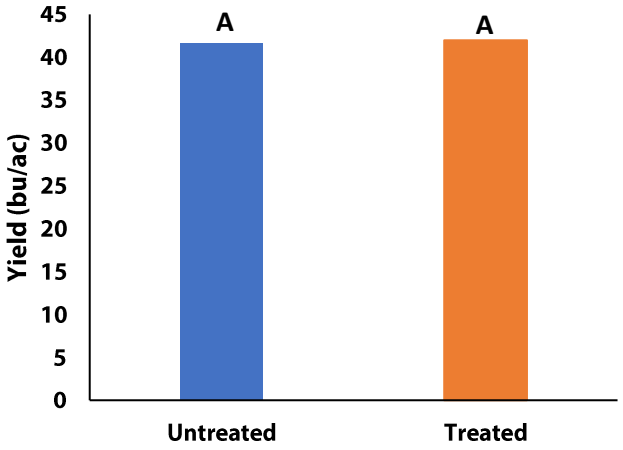
Trial Information

Treatment†	Primacy Alpha®
Application Timing	R1
Application Date	June 29
Application Rate	500 ml/ac
Application Method	Foliar Spray
Soil Texture	Clay - Clay Loam
Previous Crop	Oats
Tillage	Conventional
Seeding Date	May 11
Variety	LS0036RR
Seeding Rate	180 000 seeds/ac
Row Spacing	10
Plant Stand @ R1	90 000 plants/ac
Harvest Date	October 4

† Primacy Alpha® is a biological product intended to improve efficiency of nutrient use, to increase yield

NDVI Field Image August 15

Yield by Treatment



Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	62.4	36.3	8	82.2	188.9
Normal	58.2	92.6	77	69.9	297.7
% Normal	107%	39%	10%	118%	63%

Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Treated	42.0	$7/ac	-$7/ac
Untreated	41.6		
Yield Difference	0.4		
P-Value	0.4889		
CV	2.2%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for biological products

†† Yields were not significantly different, therefore there is no increased income to offset the cost of the biological product

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Soybean Biological Trial

Trial ID: 2021-SB05 – R.M. of De Salaberry

Objective: Quantify the agronomic and economic impacts of biological products for soybean production

Summary: There was no significant yield difference between soybeans treated with OHM® and those without. Due to the lack of yield response, there was a decrease in profit/ac in the treated area of the trial, equivalent to the cost of product application.

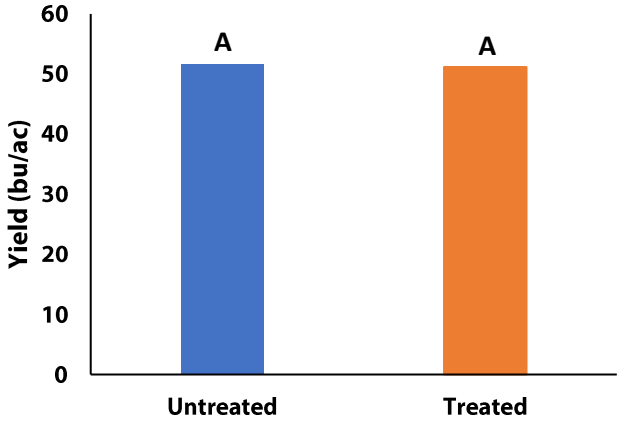
Trial Information

Treatment†	OHM®
Application Timing	R1
Application Date	July 7
Application Rate	200 ml/ac
Application Method	Foliar Spray
Soil Texture	Loamy Fine Sand
Previous Crop	Corn
Tillage	Conventional
Seeding Date	May 31
Variety	P00A49X
Seeding Rate	175 000 seeds/ac
Row Spacing	15"
Plant Stand @ R4	115 000 plants/ac
Harvest Date	September 28

† OHM® is a biological product intended to optimize nutrient use efficiency

NDVI Field Image August 14

Yield by Treatment



Precipitation (mm)

	May	Jun	Jul	Aug	Total
Rainfall	54.5	62	44.7	105	265.9
Normal	57.8	89.5	80.6	71.8	299.7
% Normal	94%	69%	55%	146%	89%

Overall Yield & Economics

	Mean (bu/ac)	Cost†	Change in Profit/ac††
Treated	51.2	$7/ac	-$7/ac
Untreated	51.7		
Yield Difference	-0.5		
P-Value	0.5156		
CV	8.3%		
Significance	**No**	**Economic**	**No**

† Based on an estimated cost for biological products

†† Yields were not significantly different, therefore there is no increased income to offset the cost of the biological product

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Wheat and Barley Plant Growth Regulator Trial

Objective: The purpose of this project is to quantify the agronomic and economic impacts of using a plant growth regulator on plant height, lodging, yield and quality of wheat and barley.

Summary: 4 site-years showed a significant difference in yield and a significant reduction in plant stand using a plant growth regulator versus untreated.

Single Site Analysis

Trial ID	Rural Municipality	Variety	Height			Yield			CV	P-Value	Statistically Significant @	Protein		
			Product A	Product B	Untreated	Product A	Product B	Untreated				Product A	Product B	Untreated
			cm			bu/ac			%		95%	%		
2021-BPGR01	Woodlands	Claymore	49^{B}	59^{A}	59^{A}	61.0^{B}	72.4^{A}	71.3^{A}	4.11	0.0023	Yes	14.4	14.0	14.4
2021-WPGR08	Dufferin	CDC SKRush	31	37	38	16.2^{B}	21.0^{A}	17.1^{B}	4.16	0.0002	Yes	15.9	15.2	16.7

Trial ID	Rural Municipality	Variety	Height		Height	Yield		Yield	CV	P-Value	Statistically Significant @	Protein	
			Treated	Untreated	Difference	Treated	Untreated	Difference				Treated	Untreated
			cm		cm	bu/ac		bu/ac	%		95%	%	
2021-BPGR02	De Salaberry	CDC Austenson	46^{A}	65^{B}	-19	87.6	94.3	-6.7	4.68	0.1122	No	13.0	13.7
2021-WPGR01	De Salaberry	AAC Brandon	74	76	-2	78.1^{A}	73.8^{B}	4.3	1.52	0.0132	Yes	15.0	15.2
2021-WPGR02	De Salaberry	Faller	64.3^{A}	68.5^{B}	-4	66.8	68.5	-1.7	3.92	0.4268	No	14.0	13.8
2021-WPGR03	Ritchot	AAC Starbuck VB	73	75	-2	61.2	58.9	2.3	8.31	0.5698	No	14.0	13.8
2021-WPGR04	Morris	SY Rowyn	72^{A}	77^{B}	5	80.5^{B}	84.1^{A}	-3.6	1.35	0.0193	Yes	13.1	12.9
2021-WPGR05	Ste. Anne	AAC Brandon	71	75	-4	67.5	66.4	1.1	5.58	0.7073	No	15.1	15.1
2021-WPGR06	Lac du Bonnet	AC Carberry	80^{A}	84^{B}	-4	69.0	69.6	-0.6	2.09	0.6693	No	13.7	13.9
2021-WPGR07	Rockwood	AAC Starbuck VB	59^{A}	62^{B}	-3	32.5	31.1	1.4	6.25	0.6719	No	16.6	16.6
2021-WPGR09	Woodlands	AAC Starbuck VB	72	72	0	30.0	29.7	0.3	2.64	0.6166	No	15.7	15.9
2021-WPGR10	Springfield	Daybreak	67^{A}	76^{B}	-9	48.1	49.4	-1.3	3.39	0.2744	No	14.6	14.2
2021-WPGR11	Westlake-Gladstone	Bolles	72^{A}	74^{B}	-2	42.6	41.6	1.0	2.22	0.2107	No	15.7	15.9
2021-WPGR12	Brokenhead	AAC Starbuck VB	80^{A}	84^{B}	-4	76.6	79.6	-3.0	2.97	0.1612	No	14.9	14.9

Indicates Statistical Difference at 95% confidence interval

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Email: hello@mbcropalliance.ca

Barley Plant Growth Regulator

Trial ID: 2021-BPGR01 — R.M. of Woodlands

Objective: The purpose of this project is to quantify the impact of two different plant growth regulators on plant height, lodging, yield and quality of barley

TRIAL INFORMATION	
Treatment	Product A vs Product B vs Untreated
Location	Marquette
Previous Crop	Soybeans
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	April 27, 2021
Variety	Claymore
Row Spacing	10”
Seeding Rate	140 lbs/ac
Fertilizer (N-P-K-S)	100N 40P
Application Date	June 07 & 10, 2021
Application Timing	Product B—GS30 (5L), Product A—GS32 (6L)
Application Rate	Product B—40 ac/jug, Product A—24 ac/jug
Harvest Date	August 16, 2021

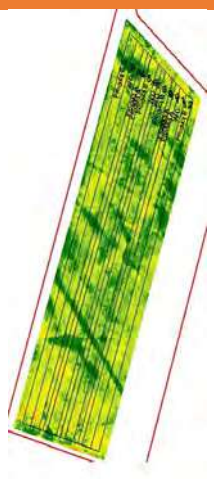
BARLEY RESPONSE

	Plant Height (cm)	Lodging		Protein %
		Incidence (%)	Severity (1-10)	
Product A	49^{B}	0	1	14.4
Product B	59^{A}	0	1	14.0
Untreated	59^{A}	0	1	14.4

OVERALL YIELD

	Mean (bu/ac)
Product A	61.0^{B}
Product B	72.4^{A}
Untreated	71.3^{A}
P-Value	0.0023
CV	4.11%
Significance	Yes

FIELD IMAGE

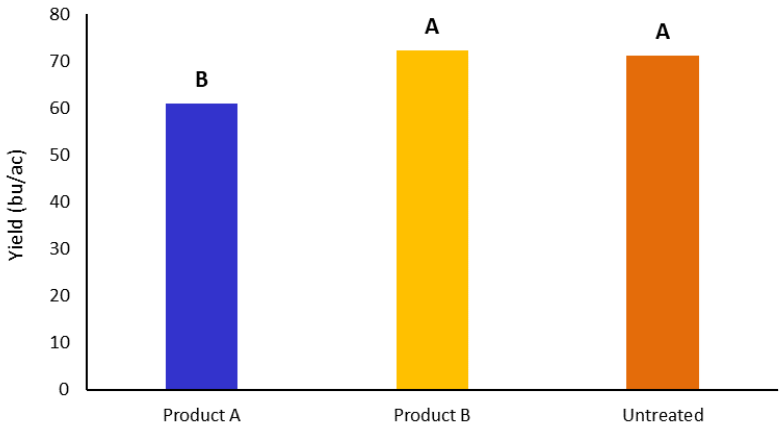


PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	36	32	12	14	**95**
Normal	51	65	55	40	**211**

†Growing season precipitation (mm) - May 01—Aug 15

YIELD BY TREATMENT



Summary: There was a significant yield difference between Product A vs. Product B plant growth regulator application and the untreated check. There was a significant reduction in plant height with the application of Product A plant growth regulator. There was no lodging observed within the trial. Rainfall was well below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Barley Plant Growth Regulator

Trial ID: 2021-BPGR02 — R.M. of De Salaberry

Objective: The purpose of this project is to quantify the impact of the plant growth regulator Moddus® (trinexapac-ethyl) on plant height, lodging, yield and quality of barley

TRIAL INFORMATION	
Treatment	Moddus® vs. Untreated
Location	Arnaud
Previous Crop	Soybeans
Soil Texture	Clay
Tillage	Zero Tillage
Planting Date	April 27, 2021
Variety	CDC Austenson
Row Spacing	10”
Seeding Rate	139 lbs/ac
Fertilizer (N-P-K-S)	105N
Application Date	June 15, 2021
Application Timing	GS30 (5L)
Application Rate	24 ac/jug
Harvest Date	August 13, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	35	61	12	51	**160**
Normal	52	86	63	41	**242**

†Growing season precipitation (mm) - May 01—Aug 15

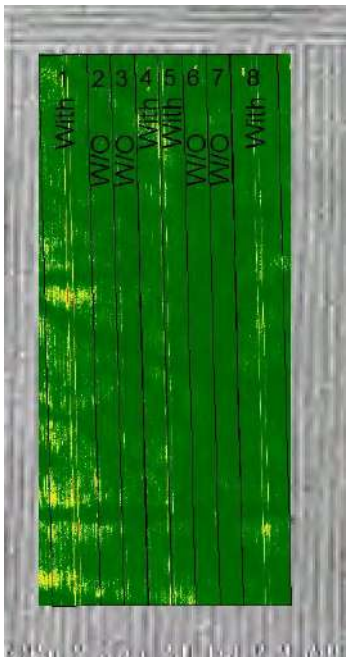
BARLEY RESPONSE

	Plant Height (cm)	Lodging		Protein %
		Incidence (%)	Severity (1-10)	
Moddus®	46^{A}	0	1	13.7
Untreated	64^{B}	0	1	13.0

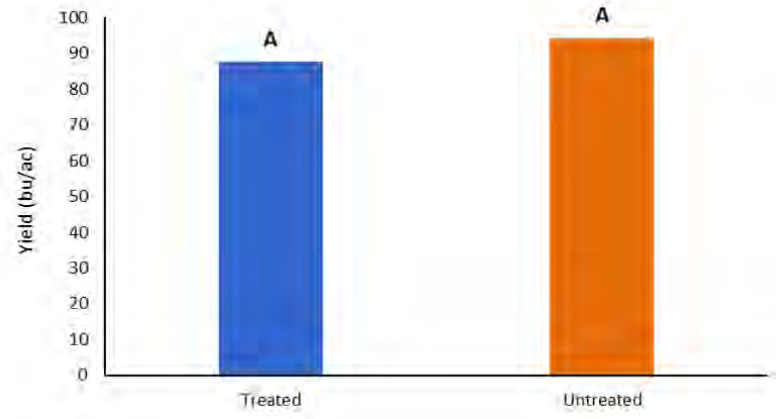
OVERALL YIELD

	Mean (bu/ac)
Moddus®	87.6^{A}
Untreated	94.3^{A}
Yield Difference	-6.7
P-Value	0.1122
CV	4.68%
Significance	No

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the Moddus® (trinexapac-ethyl) plant growth regulator application and the untreated check. There was a significant reduction in plant height due to the application of the plant growth regulator. There was no lodging observed within the trial. Rainfall was below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Plant Growth Regulator

Trial ID: 2021-WPGR01 — R.M. of De Salaberry

Objective: The purpose of this project is to quantify the impact of the plant growth regulator Manipulator™ 620 (chlormequat chloride) on plant height, lodging, yield and quality of spring wheat

TRIAL INFORMATION	
Treatment	Manipulator™ 620 vs. Untreated
Location	Otterburne
Previous Crop	Corn
Soil Texture	Clay
Tillage	Zero Tillage
Planting Date	April 29, 2021
Variety	AAC Brandon
Row Spacing	10”
Seeding Rate	135 lbs/ac
Fertilizer (N-P-K-S)	136N 30P
Application Date	June 02, 2021
Application Timing	GS29 (4L)
Application Rate	0.7 L/ac
Harvest Date	August 08, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	35	61	12	51	**160**
Normal	52	86	63	41	**242**

†Growing season precipitation (mm) - May 01—Aug 15

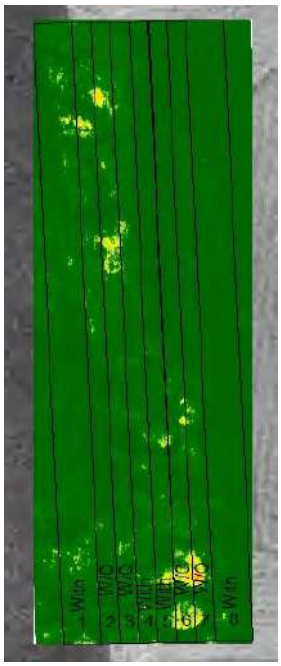
WHEAT RESPONSE

	Plant Height (cm)	Lodging		Protein %
		Incidence (%)	Severity (1-10)	
Manipulator™ 620	74[A]	0	1	15.0
Untreated	76[A]	1	1	15.2

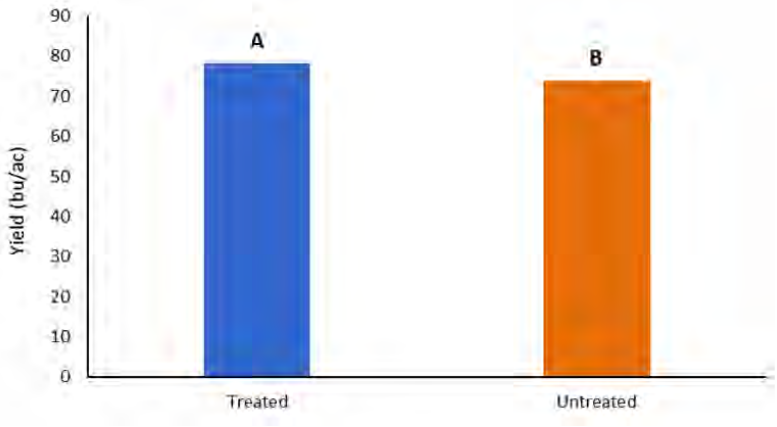
OVERALL YIELD

	Mean (bu/ac)
Manipulator™ 620	78.1[A]
Untreated	73.8[B]
Yield Difference	4.3
P-Value	0.0132
CV	1.52%
Significance	Yes

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was a significant yield difference between the Manipulator™ 620 (chlormequat chloride) plant growth regulator application and the untreated check. There was no significant reduction in plant height with the application of the plant growth regulator. There was low amounts of lodging observed within the trial. Rainfall was below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Plant Growth Regulator

Trial ID: 2021-WPGR02 — R.M. of De Salaberry

Objective: The purpose of this project is to quantify the impact of the plant growth regulator Manipulator™ 620 (chlormequat chloride) at different stages on plant height, lodging, yield and quality of spring wheat

TRIAL INFORMATION	
Treatment	Manipulator™ 620 vs. Untreated
Location	St. Pierre
Previous Crop	Canola
Soil Texture	Clay
Tillage	Zero Tillage
Planting Date	May 05, 2021
Variety	Faller
Row Spacing	7.5”
Seeding Rate	162 lbs/ac
Fertilizer (N-P-K-S)	140N
1st Application	June 07, 2021 @ GS29 (4L)
2nd Application	June 16, 2021 @ GS32 (6L)
Application Rate	0.35 L/ac (each application)
Harvest Date	August 14, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	35	61	12	51	**160**
Normal	52	86	63	41	**242**

†Growing season precipitation (mm) - May 01—Aug 15

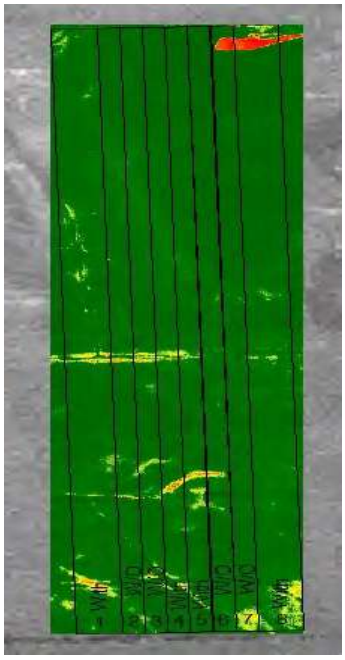
WHEAT RESPONSE

	Plant Height (cm)	Lodging		Protein %
		Incidence (%)	Severity (1-10)	
Manipulator™ 620	64.3^{A}	0	1	14.0
Untreated	72.0^{B}	0	1	13.8

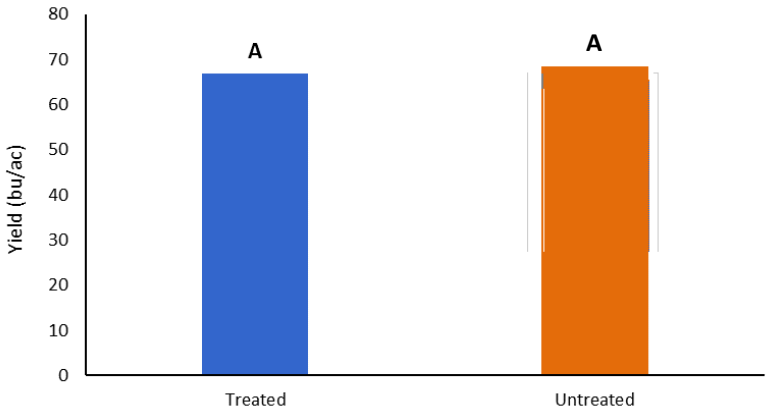
OVERALL YIELD

	Mean (bu/ac)
Manipulator™ 620	66.8^{A}
Untreated	68.5^{A}
Yield Difference	-1.7
P-Value	0.4268
CV	3.92%
Significance	No

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the Manipulator™ 620 (chlormequat chloride) plant growth regulator application and the untreated check. There was a significant reduction in plant height with the application of the plant growth regulator. There was no lodging observed within the trial. Rainfall was below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Plant Growth Regulator

Trial ID: 2021-WPGR03 — R.M. of Ritchot

Objective: The purpose of this project is to quantify the impact of the plant growth regulator Omex EZ-GRO K (6-Furfurylaminopurine (Kinetin) on plant height, lodging, yield and quality of spring wheat

TRIAL INFORMATION	
Treatment	Omex EZ-GRO K vs. Untreated
Location	Niverville
Previous Crop	Soybeans
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	April 25, 2021
Variety	AAC Starbuck VB
Row Spacing	10”
Seeding Rate	120 lbs/ac
Fertilizer (N-P-K-S)	150N
Application Date	June 07, 2021
Application Timing	GS29 (4L)
Application Rate	40 ac/jug
Harvest Date	August 10, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	18	60	9	17	**104**
Normal	56	83	64	45	**248**

†Growing season precipitation (mm) - May 01—Aug 15

WHEAT RESPONSE

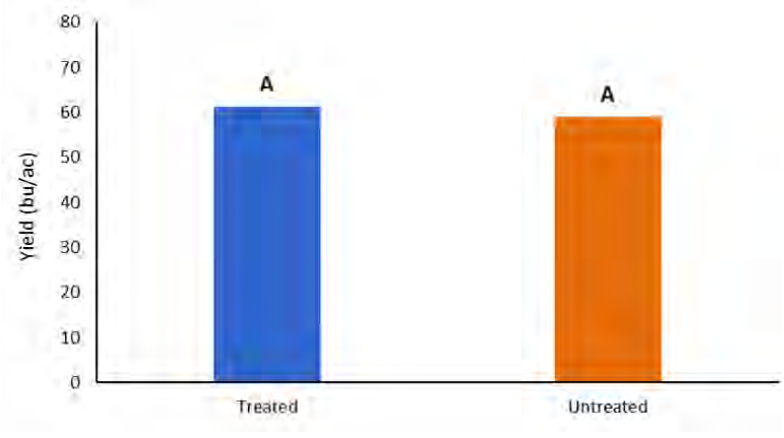
	Plant Height (cm)	Lodging		Protein %
		Incidence (%)	Severity (1-10)	
Omex EZ-GRO K	73[A]	0	1	14.0
Untreated	75[A]	0	1	13.8

OVERALL YIELD

	Mean (bu/ac)
Omex EZ-GRO K	61.2[A]
Untreated	58.9[A]
Yield Difference	2.3
P-Value	0.5698
CV	8.31%
Significance	No

FIELD IMAGE

YIELD BY TREATMENT



Summary: There was no significant yield difference between the Omex EZ-GRO K (6-Furfurylaminopurine (Kinetin) plant growth regulator application and the untreated check. There was no significant reduction in plant height with the application of the plant growth regulator. There was no lodging observed within the trial. Rainfall was well below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Plant Growth Regulator

Trial ID: 2021-WPGR04 — R.M. of Morris

Objective: The purpose of this project is to quantify the impact of the plant growth regulator Moddus® (trinexapac-ethyl) on plant height, lodging, yield and quality of spring wheat

TRIAL INFORMATION	
Treatment	Moddus® vs. Untreated
Location	Morris
Previous Crop	Canola
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	May 05, 2021
Variety	SY Rowyn
Row Spacing	10”
Seeding Rate	110 lbs/ac
Fertilizer (N-P-K-S)	120N 30P
Application Date	June 08, 2021
Application Timing	GS30 (5L)
Application Rate	30 ac/jug
Harvest Date	September 01, 2021

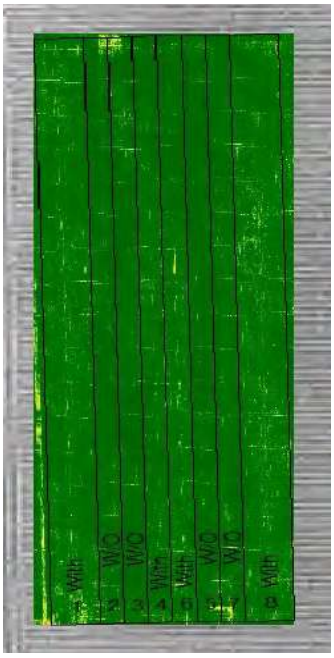
PRECIPITATION†	May	June	July	Aug	Total
Rainfall	39	49	19	25	**132**
Normal	51	82	65	46	**244**

†Growing season precipitation (mm) - May 01—Aug 15

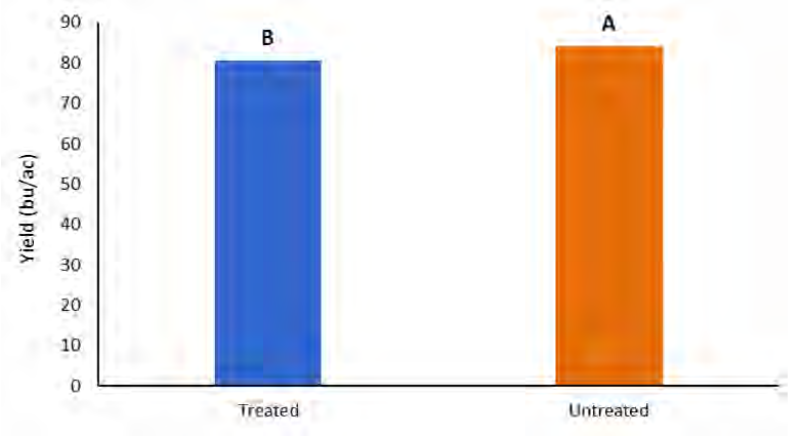
WHEAT RESPONSE	Plant Height (cm)	Lodging		Protein %
		Incidence (%)	Severity (1-10)	
Moddus®	72^{A}	0	1	13.1
Untreated	77^{B}	0	1	12.9

OVERALL YIELD	Mean (bu/ac)
Moddus®	80.5^{B}
Untreated	84.1^{A}
Yield Difference	-3.6
P-Value	0.0193
CV	1.35%
Significance	**Yes**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was a significant yield difference between the Moddus® (trinexapac-ethyl) plant growth regulator application and the untreated check. There was a significant reduction in plant height with the application of the plant growth regulator. There was no lodging observed within the trial. Rainfall was below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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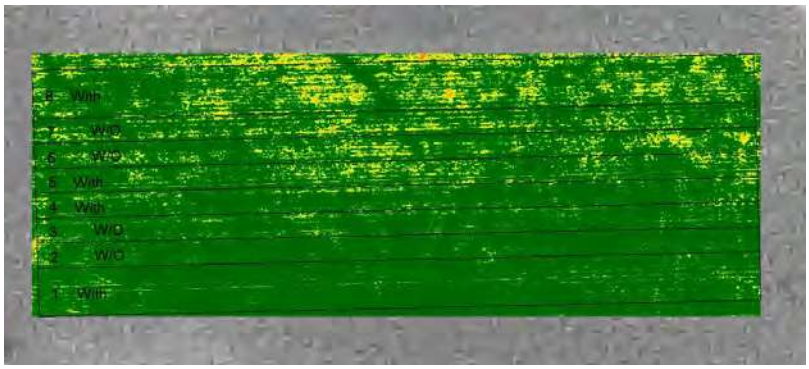
Wheat Plant Growth Regulator

Trial ID: 2021-WPGR05 — R.M. of Ste. Anne

Objective: The purpose of this project is to quantify the impact of the plant growth regulator Moddus® (trinexapac-ethyl) on plant height, lodging, yield and quality of spring wheat

TRIAL INFORMATION	
Treatment	Moddus® vs. Untreated
Location	Landmark
Previous Crop	Soybeans
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	April 29, 2021
Variety	AAC Brandon
Row Spacing	10”
Seeding Rate	153 lbs/ac
Fertilizer (N-P-K-S)	173N
Application Date	June 04, 2021
Application Timing	GS30 (5L)
Application Rate	30 ac/jug
Harvest Date	August 06, 2021

FIELD IMAGE



PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	38	54	14	44	**150**
Normal	49	65	94	112	**320**

†Growing season precipitation (mm) - May 01—Aug 15

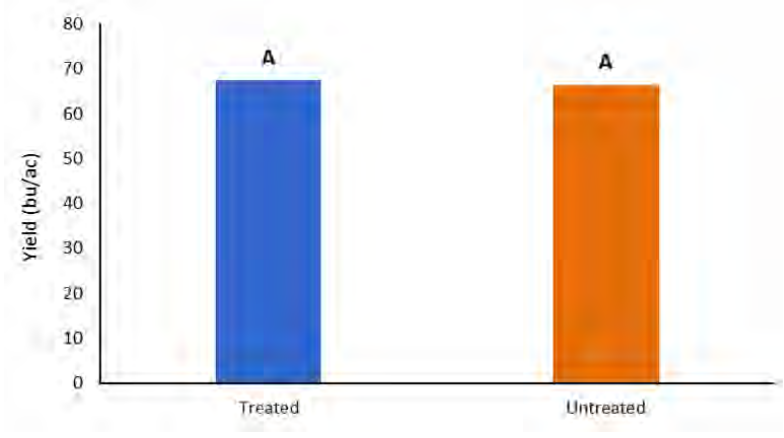
WHEAT RESPONSE

	Plant Height (cm)	Lodging		Protein %
		Incidence (%)	Severity (1-10)	
Moddus®	71[A]	0	1	15.1
Untreated	75[A]	0	1	15.1

OVERALL YIELD

	Mean (bu/ac)
Moddus®	67.5[A]
Untreated	66.4[A]
Yield Difference	1.1
P-Value	0.7073
CV	5.58%
Significance	No

YIELD BY TREATMENT



Summary: There was no significant yield difference between the Moddus® (trinexapac-ethyl) plant growth regulator application and the untreated check. There was no significant reduction in plant height due to the application of the plant growth regulator. There was no lodging observed within the trial. Rainfall was below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Plant Growth Regulator

Trial ID: 2021-WPGR06 — R.M. of Lac du Bonnet

Objective: The purpose of this project is to quantify the impact of the plant growth regulator Manipulator™ 620 (chlormequat chloride) on plant height, lodging, yield and quality of spring wheat

TRIAL INFORMATION	
Treatment	Manipulator™ 620 vs. Untreated
Location	Molsen
Previous Crop	Wheat
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	May 09, 2021
Variety	AC Carberry
Row Spacing	9”
Seeding Rate	150 lbs/ac
Fertilizer (N-P-K-S)	126N 52P 60K 27S
Application Date	June 08, 2021
Application Timing	GS30 (5L)
Application Rate	0.7 L/ac
Harvest Date	August 18, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	52	26	24	33	**134**
Normal	51	85	71	38	**244**

†Growing season precipitation (mm) - May 01—Aug 15

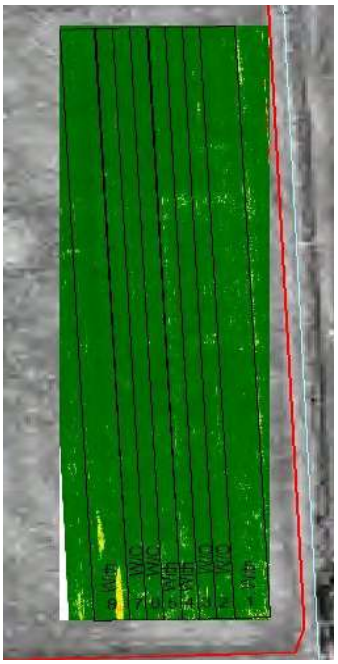
WHEAT RESPONSE

	Plant Height (cm)	Lodging		Protein %
		Incidence (%)	Severity (1-10)	
Manipulator™ 620	80[A]	0	1	13.7
Untreated	84[B]	1	1	13.9

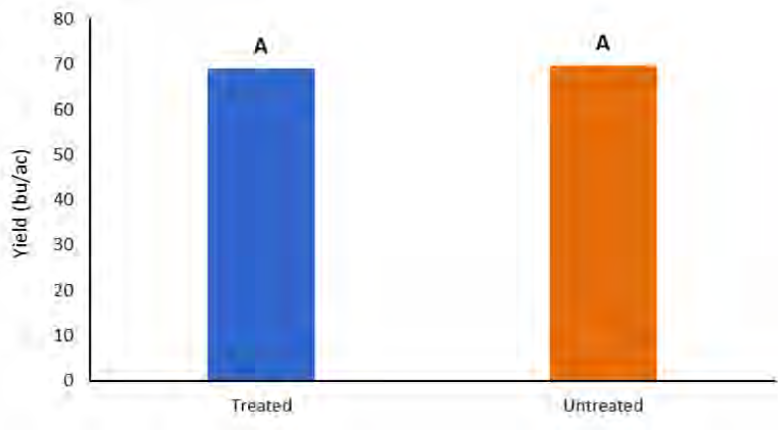
OVERALL YIELD

	Mean (bu/ac)
Manipulator™ 620	69.0[A]
Untreated	69.6[A]
Yield Difference	-0.6
P-Value	0.6693
CV	2.09%
Significance	No

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the Manipulator™ 620 (chlormequat chloride) plant growth regulator application and the untreated check. There was a significant reduction in plant height due to the application of the plant growth regulator. There was very low amounts of lodging observed within the trial. Rainfall was below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Plant Growth Regulator

Trial ID: 2021-WPGR07 — R.M. of Rockwood

Objective: The purpose of this project is to quantify the impact of the plant growth regulator Moddus® (trinexapac-ethyl) on plant height, lodging, yield and quality of spring wheat

TRIAL INFORMATION	
Treatment	Moddus® vs. Untreated
Location	Balmoral
Previous Crop	Peas
Soil Texture	Coarse Loams
Tillage	Conventional Tillage
Planting Date	May 04, 2021
Variety	AAC Starbuck VB
Row Spacing	10”
Seeding Rate	105 lbs/ac
Fertilizer (N-P-K-S)	117N 55P 21K
Application Date	June 13, 2021
Application Timing	GS32 (6L)
Application Rate	30 ac/jug
Harvest Date	August 06, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	40	32	13	34	**119**
Normal	52	87	63	41	**242**

†Growing season precipitation (mm) - May 01—Aug 15

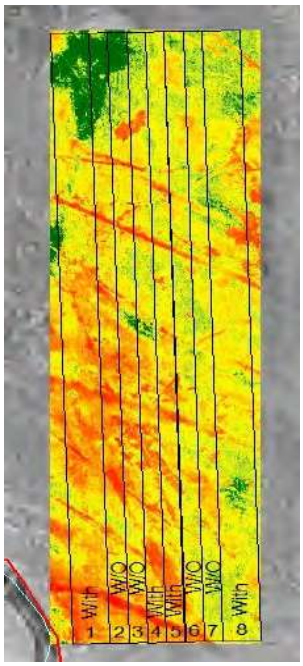
WHEAT RESPONSE

	Plant Height (cm)	Lodging		Protein %
		Incidence (%)	Severity (1-10)	
Moddus®	59[A]	0	1	16.6
Untreated	62[B]	0	1	16.6

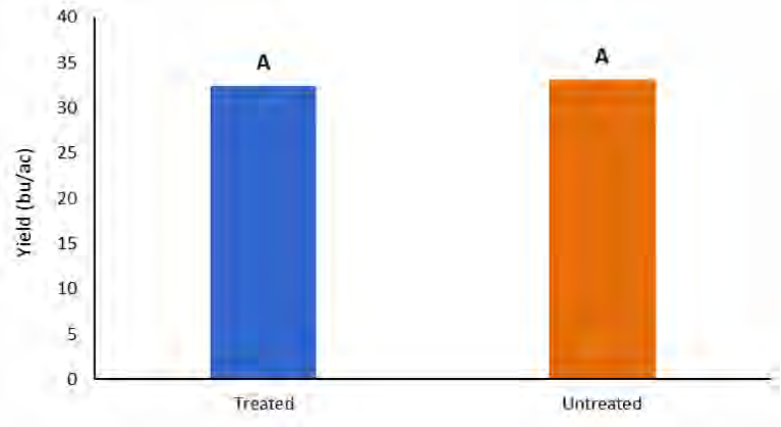
OVERALL YIELD

	Mean (bu/ac)
Moddus®	32.5[A]
Untreated	31.1[A]
Yield Difference	-0.6
P-Value	0.6719
CV	6.25%
Significance	No

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the Moddus® (trinexapac-ethyl) plant growth regulator application and the untreated check. There was a significant reduction in plant height due to the application of the plant growth regulator. There was no lodging observed within the trial. Rainfall was well below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Plant Growth Regulator

Trial ID: 2021-WPGR08 — R.M. of Dufferin

Objective: The purpose of this project is to quantify the impact of two different plant growth regulators on plant height, lodging, yield and quality of spring wheat

TRIAL INFORMATION	
Treatment	Product A vs Product B vs Untreated
Location	Homewood
Previous Crop	Peas
Soil Texture	Clay Loams
Tillage	Conventional Tillage
Planting Date	April 26, 2021
Variety	CDC SKRush
Row Spacing	7.5”
Seeding Rate	121 lbs/ac
Fertilizer (N-P-K-S)	98N 50P 10S
Application Date	June 13, 2021
Application Timing	GS32 (6L)
Application Rate	Product A—30 ac/jug; Product B—0.7 L/ac
Harvest Date	August 03, 2021

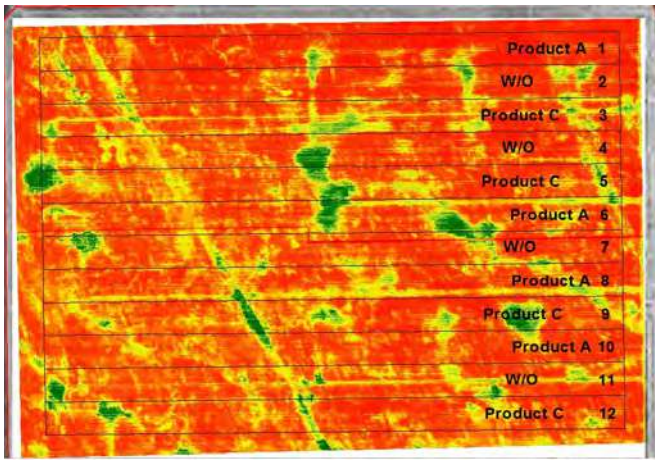
WHEAT RESPONSE

	Plant Height (cm)	Lodging		Protein %
		Incidence (%)	Severity (1-10)	
Product A	31^{A}	0	1	15.9
Product B	37^{A}	0	1	15.2
Untreated	38^{A}	0	1	16.7

OVERALL YIELD

	Mean (bu/ac)
Product A	16.2^{B}
Product B	21.0^{A}
Untreated	17.1^{B}
P-Value	0.0002
CV	4.16%
Significance	Yes

FIELD IMAGE

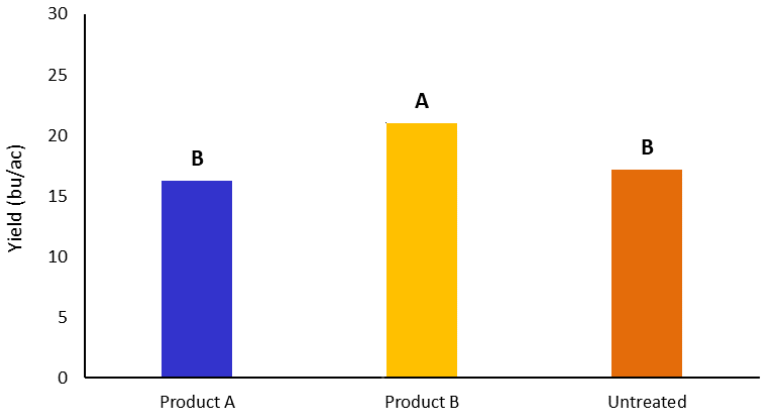


PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	29	104	16	23	**173**
Normal	53	74	60	50	**237**

†Growing season precipitation (mm) - May 01—Aug 15

YIELD BY TREATMENT



Summary: There was a significant yield difference between Product B vs. Product A plant growth regulator application and the untreated check. There was no significant reduction in plant height with the application of plant growth regulators. There was no lodging observed within the trial. Rainfall was below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Plant Growth Regulator

Trial ID: 2021-WPGR09 — R.M. of Woodlands

Objective: The purpose of this project is to quantify the impact of the plant growth regulator Moddus® (trinexapac-ethyl) on plant height, lodging, yield and quality of spring wheat

TRIAL INFORMATION	
Treatment	Moddus® vs. Untreated
Location	Warren
Previous Crop	Clover
Soil Texture	Fine Loams
Tillage	Conventional Tillage
Planting Date	April 28, 2021
Variety	AAC Starbuck VB
Row Spacing	10”
Seeding Rate	100 lbs/ac
Fertilizer (N-P-K-S)	130N 45P 10K
Application Date	June 13, 2021
Application Timing	GS30 (5L)
Application Rate	30 ac/jug
Harvest Date	August 03, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	36	32	12	14	**95**
Normal	51	65	55	40	**211**

†Growing season precipitation (mm) - May 01—Aug 15

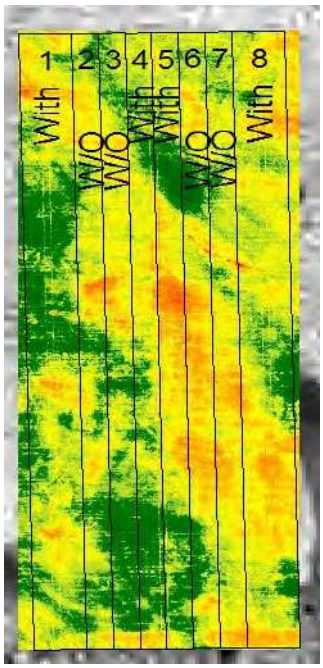
WHEAT RESPONSE

	Plant Height (cm)	Lodging		Protein %
		Incidence (%)	Severity (1-10)	
Moddus®	72[A]	0	1	15.7
Untreated	72[A]	0	1	15.9

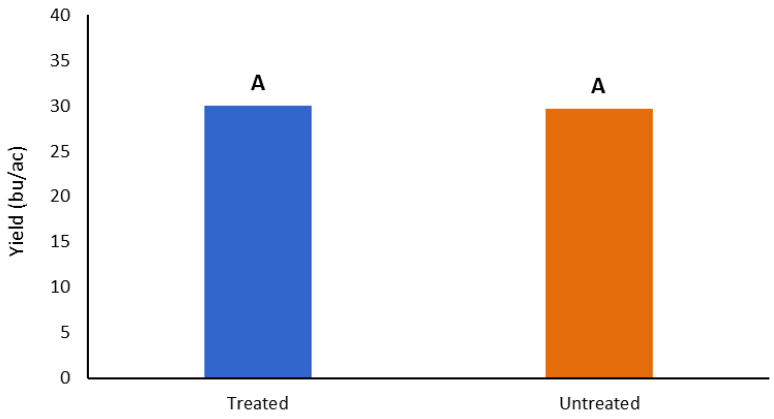
OVERALL YIELD

	Mean (bu/ac)
Moddus®	30.0[A]
Untreated	29.7[A]
Yield Difference	0.3
P-Value	0.6166
CV	2.64%
Significance	No

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the Moddus® (trinexapac-ethyl) plant growth regulator application and the untreated check. There was no significant reduction in plant height due to the application of the plant growth regulator. There was no lodging observed within the trial. Rainfall was well below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Plant Growth Regulator

Trial ID: 2021-WPGR10 — R.M. of Springfield

Objective: The purpose of this project is to quantify the impact of the plant growth regulator Moddus® (trinexapac-ethyl) on plant height, lodging, yield and quality of spring wheat

TRIAL INFORMATION	
Treatment	Moddus® vs. Untreated
Location	Hazelridge
Previous Crop	Sunflower
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	April 28, 2021
Variety	Daybreak
Row Spacing	10”
Seeding Rate	150 lbs/ac
Fertilizer (N-P-K-S)	120N 40P 25S
Application Date	June 14, 2021
Application Timing	GS30 (5L)
Application Rate	30 ac/jug
Harvest Date	August 16, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	52	26	24	33	**134**
Normal	51	85	71	38	**244**

†Growing season precipitation (mm) - May 01—Aug 15

WHEAT RESPONSE

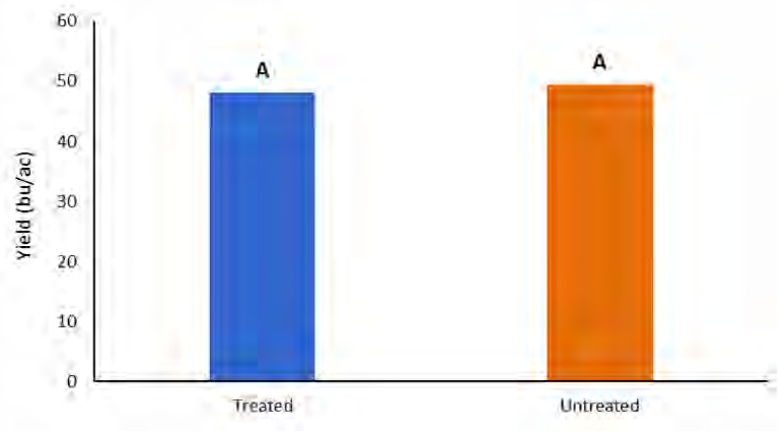
	Plant Height (cm)	Lodging		Protein %
		Incidence (%)	Severity (1-10)	
Moddus®	67[A]	0	1	14.6
Untreated	76[B]	0	1	14.2

OVERALL YIELD

	Mean (bu/ac)
Moddus®	48.1[A]
Untreated	49.4[A]
Yield Difference	-1.3
P-Value	0.2744
CV	3.39%
Significance	No

FIELD IMAGE

YIELD BY TREATMENT



Summary: There was no significant yield difference between the Moddus® (trinexapac-ethyl) plant growth regulator application and the untreated check. There was a significant reduction in plant height due to the application of the plant growth regulator. There was no lodging observed within the trial. Rainfall was below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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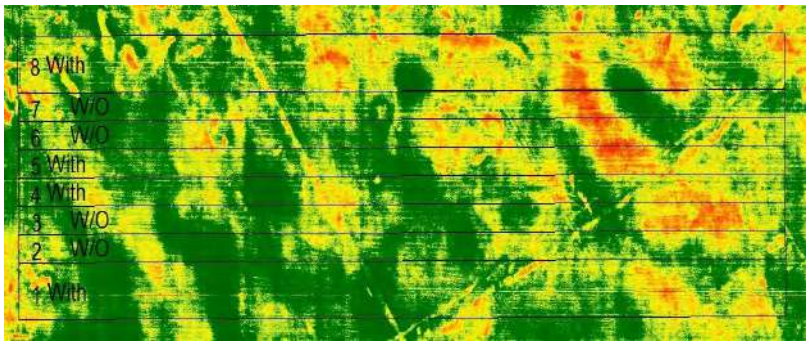
Wheat Plant Growth Regulator

Trial ID: 2021-WPGR11 — R.M. of Westlake-Gladstone

Objective: The purpose of this project is to quantify the impact of the plant growth regulator Moddus® (trinexapac-ethyl) on plant height, lodging, yield and quality of spring wheat

TRIAL INFORMATION	
Treatment	Moddus® vs. Untreated
Location	Plumas
Previous Crop	Soybeans
Soil Texture	Coarse Loams
Tillage	Conventional Tillage
Planting Date	May 02, 2021
Variety	Bolles
Row Spacing	10”
Seeding Rate	120 lbs/ac
Fertilizer (N-P-K-S)	105N 40P 40K 18S
Application Date	June 14, 2021
Application Timing	GS30 (5L)
Application Rate	30 ac/jug
Harvest Date	August 13, 2021

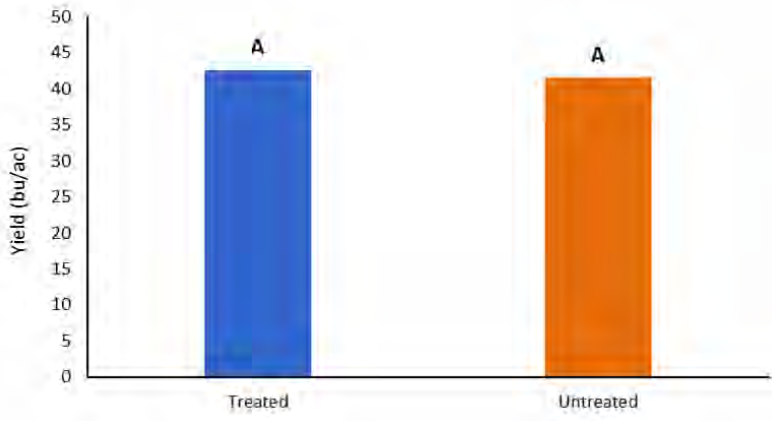
FIELD IMAGE



PRECIPITATION†					
	May	**June**	**July**	**Aug**	**Total**
Rainfall	15	39	28	38	**120**
Normal	47	72	58	41	**218**

†Growing season precipitation (mm) - May 01—Aug 15

YIELD BY TREATMENT



WHEAT RESPONSE				
	Plant Height (cm)	**Lodging**		**Protein %**
		Incidence (%)	**Severity (1-10)**	
Moddus®	72[A]	0	1	15.7
Untreated	74[B]	0	1	15.9

OVERALL YIELD	
	Mean (bu/ac)
Moddus®	42.6[A]
Untreated	41.6[A]
Yield Difference	1.0
P-Value	0.2107
CV	2.22%
Significance	**No**

Summary: There was no significant yield difference between the Moddus® (trinexapac-ethyl) plant growth regulator application and the untreated check. There was a significant reduction in plant height due to the application of the plant growth regulator. There was no lodging observed within the trial. Rainfall was below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Plant Growth Regulator

Trial ID: 2021-WPGR12 — R.M. of Brokenhead

Objective: The purpose of this project is to quantify the impact of the plant growth regulator Moddus® (trinexapac-ethyl) on plant height, lodging, yield and quality of spring wheat

TRIAL INFORMATION	
Treatment	Moddus® vs. Untreated
Location	Beausejour
Previous Crop	Soybeans
Soil Texture	Clay Loams
Tillage	Conventional Tillage
Planting Date	April 30, 2021
Variety	AAC Starbuck VB
Row Spacing	10”
Seeding Rate	120 lbs/ac
Residual N	——
Fertilizer (N-P-K-S)	143N 41P
Application Date	June 14, 2021
Application Timing	GS30 (5L)
Application Rate	30 ac/jug
Harvest Date	August 16, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	52	26	24	33	**134**
Normal	51	85	71	38	**244**

†Growing season precipitation (mm) - May 01—Aug 15

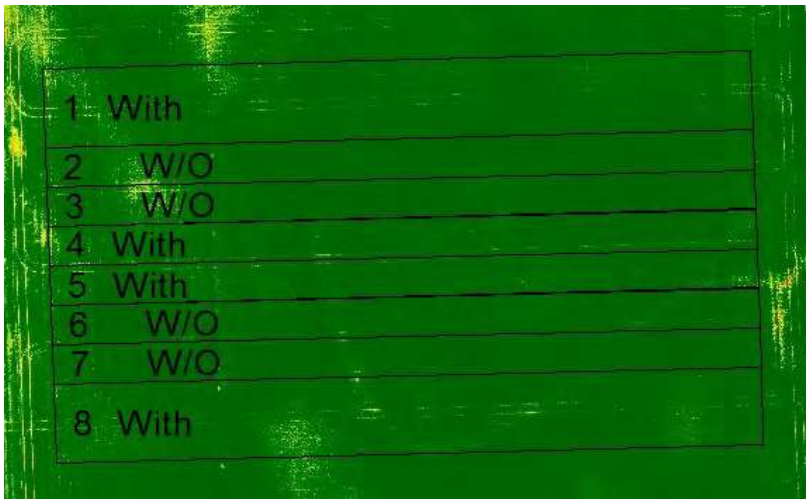
WHEAT RESPONSE

	Plant Height (cm)	Lodging		Protein %
		Incidence (%)	Severity (1-10)	
Moddus®	80[A]	0	1	14.9
Untreated	84[B]	0	1	14.9

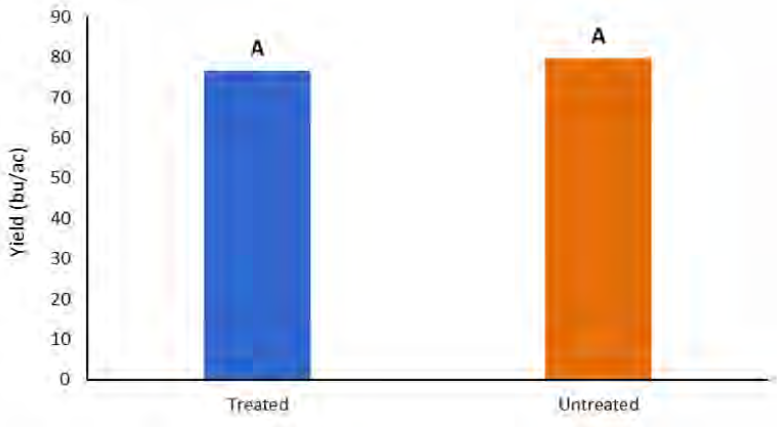
OVERALL YIELD

	Mean (bu/ac)
Moddus®	76.6[A]
Untreated	79.6[A]
Yield Difference	-3.0
P-Value	0.1612
CV	2.97%
Significance	No

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the Moddus® (trinexapac-ethyl) plant growth regulator application and the untreated check. There was a significant reduction in plant height due to the application of the plant growth regulator. There was no lodging observed within the trial. Rainfall was below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Quality Analysis of Spring Wheat Treated with a Plant Growth Regulator

Plant growth regulators (PGRs) are a crop protection product used to reduce plant height and improve standability in wheat. While PGRs have been tested to ensure they do not compromise agronomics or disease resistance, minimal testing has been completed to determine the effect PGRs have on the quality of wheat and flour. ***The objective of this study was to assess the quality of wheat, flour and end-products of spring wheat varieties treated with a PGR.***

Key Points

- Overall, differences were minimal in wheat, flour, and end-product quality of varieties treated with and without a PGR
- Variety had more of an effect on quality than PGR application
- The presence of downgrading factors likely played a role in any observed differences

Materials & Methods

- Seven spring wheat varieties (6 CWRS & 1 CNHR) were grown at 21 locations across Manitoba during 2019 and 2020
  - 2019—AAC Brandon, AAC Cameron VB, AC Cardale, SY Rowyn, Faller
  - 2020—AAC Brandon, AAC Redberry, AAC Starbuck VB, Faller
- Two treatments: a single application of a PGR (Manipulator™—AI: chlormequat chloride) at GS 31-32 and an untreated check
- Grading was completed on all samples to identify downgrading factors, and the following analyses were performed:
  - Wheat: protein content, falling number (FN), wet gluten, gluten index (GI), ash content, particle size index (PSI)
  - Lab milling
  - Flour: protein content, ash content, wet gluten, colour, starch damage, Amylograph peak viscosity, Farinograph, Extensograph
  - End-product: two baking procedures—no time dough (NTD) and long-time fermentation (LTF)

Results

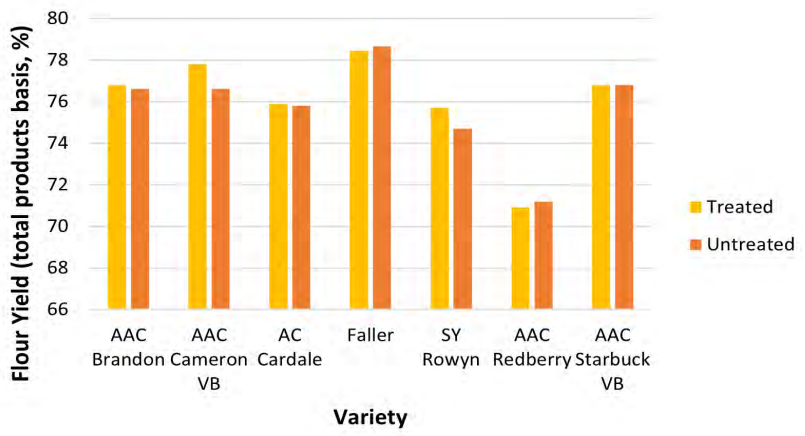

Figure 1. Mean comparison of flour yield (total products) of PGR-treated and untreated spring wheat varieties from 2019 & 2020. Results for AAC Brandon and Faller are a 2-year average.

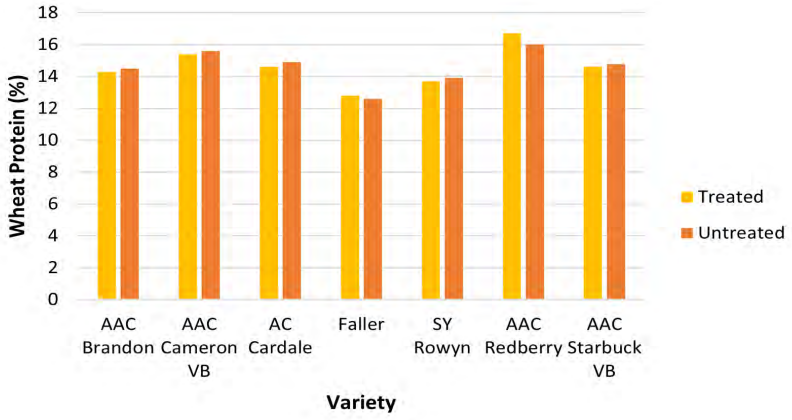

Figure 2. Mean comparison of wheat protein content (CNA—corrected to 13.5% moisture) of PGR-treated and untreated spring wheat varieties from 2019 & 2020. Results for AAC Brandon and Faller are a 2-year average.

Results

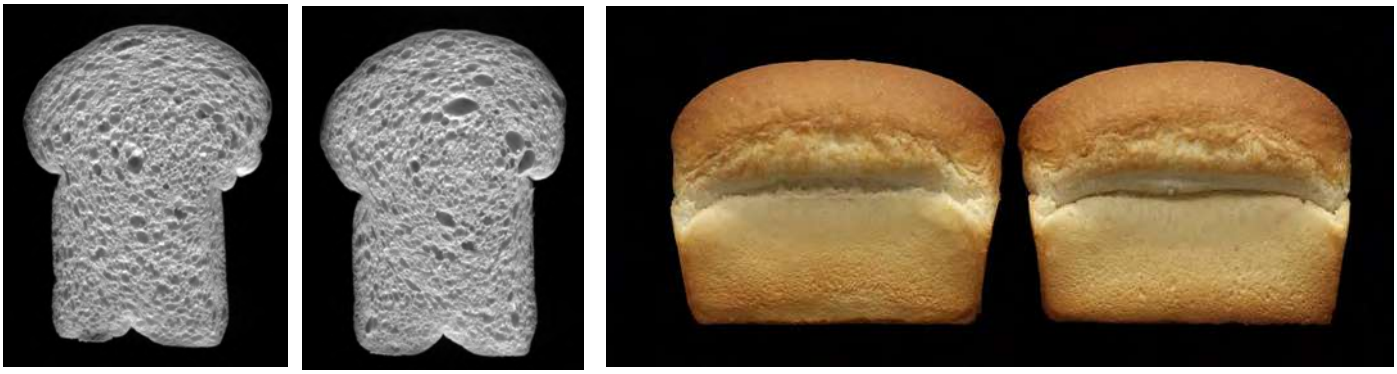

Figure 3. No time dough (NTD) baking procedure. Left: Internal crumb structure of AAC Brandon—treated with a PGR. Middle: Internal crumb structure of AAC Brandon—untreated. Right: Untreated (left) vs. treated (right) loaf comparison of AAC Brandon.

Summary

- Most samples graded as either No. 1 or No. 2 CWRS or No. 1 CNHR
- Main downgrading factor in 2019 & 2020 was hard vitreous kernels (HVK)
- Minimal differences were observed between treated and untreated samples for milling yield, protein content, and wheat & flour wet gluten content
- There was minimal effect on gluten strength (measured with Farinograph & Extensograph Rmax) between treated and untreated samples. Variety had a larger impact on gluten strength than treatment with a PGR
- End-product testing revealed that the use of PGRs had minimal effect on flour baking performance and bread quality

Funding

Funded in part by the Government of Canada under the Canadian Agricultural Partnership's AgriScience Program, a federal, provincial, territorial initiative, with industry support from Cereals Canada and the Manitoba Crop Alliance. Thank you to Tone Ag Consulting for the research support.

Additional Resources

Cereals Canada Quality Evaluation Methods

Cereals Canada

Manitoba Crop Alliance

Wheat Seeding Rate Trial

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal seeding in wheat.

Summary: 2 site-years showed a significant difference in yield while 3 site-years had a significant difference in plant stands between the three seeding rates.

Table 1: Single Site Analysis

Trial ID	Rural Municipality	Variety	Seed Rate (check)	Plant Stand @ Mid-season			Yield			CV	P-Value	Statistically Significant @
				Low Seed Rate	Check Seed Rate	High Seed Rate	Low Seed Rate	Check Seed Rate	High Seed Rate			
			lbs/ac	/ft²			bu/ac			%		95%
2021-WP01	Grey	Bolles	135	28^{B}	34^{B}	53^{A}	32.4^{A}	30.7^{AB}	29.7^{B}	3.31	0.0288	Yes
2021-WP02	Woodlands	AAC Brandon	120	25	25	35	68.2^{A}	64.3^{B}	60.9^{B}	3.05	0.0056	Yes
2021-WP03	Grey	AAC Starbuck VB	120	19	25	28	30.2	29.5	29.7	2.96	0.5012	No
2021-WP04	Oakland-Wawanesa	AAC Wheatland VB	120	24^{B}	32^{AB}	41^{A}	71.9	72.5	73.0	0.96	0.1396	No
2021-WP05	MacDonald	AAC Starbuck VB	130	26	24	24	38.5	37.4	36.4	3.74	0.1688	No
2021-WP06	Morris	AAC Starbuck VB	110	20^{B}	21^{B}	28^{A}	68.7	70.1	69.1	1.17	0.1176	No

Table 2: Economic Analysis

Trial ID	Seed Rate (check)	Seed Cost/Acre			Yield			Net Profit/Acre (Seed Costs)			CV	P-Value	Statistically Significant @
		Low Seed Rate	Check Seed Rate	High Seed Rate	Low Seed Rate	Check Seed Rate	High Seed Rate	Low Seed Rate	Check Seed Rate	High Seed Rate			
	lbs/ac	$/ac			bu/ac			$/ac			%		95%
2021-WP01	135	$ 19.44	$ 29.16	$ 38.88	32.4	30.7	29.7	$ 369.36	$ 339.24	$ 317.52	3.31	0.0288	Yes
2021-WP02	120	$ 19.44	$ 25.92	$ 34.56	68.2	64.3	60.9	$ 798.96	$ 745.68	$ 696.24	3.05	0.0056	Yes

Indicates Statistical Difference at 95% confidence interval

Median Seed Cost of $0.216/lb

HRS Wheat Price (Nov 2021) - $12/bushel

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Wheat Seeding Rate

Trial ID: 2021-WP01 — R.M. of Grey

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal seeding rate in spring wheat.

TRIAL INFORMATION

Location	Culross
Previous Crop	Oats
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	April 09, 2021
Variety	Bolles
Row Spacing	10”
Seeding Rate (lbs/ac)	90, 135 & 180
Fertilizer (N-P-K-S)	131N 52P
Harvest Date	July 29, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	50	71	16	23	**160**
Normal	53	74	60	48	**235**

†Growing season precipitation (mm) - May 01—Aug 15

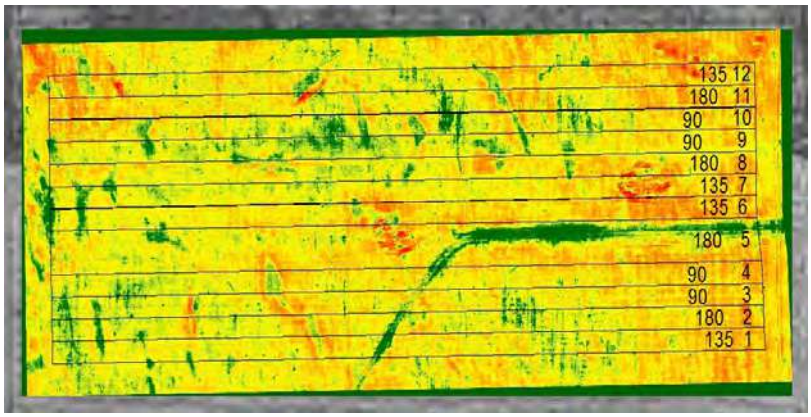
WHEAT RESPONSE

	Plant Stand/ft²	Protein	TWT (kg/hL)	Falling Number
90 lbs/ac	28^{B}	16.9	78	428
135 lbs/ac	34^{B}	- -	- -	- -
180 lbs/ac	53^{A}	- -	- -	- -

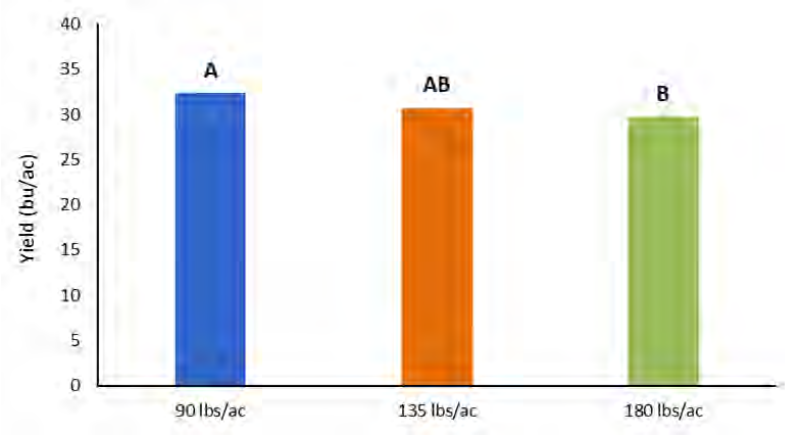
OVERALL YIELD

	Mean (bu/ac)
90 lbs/ac	32.4^{A}
135 lbs/ac	30.7^{AB}
180 lbs/ac	29.7^{B}
P-Value	0.0288
CV	3.31%
Significance	**Yes**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was a significant difference in yield between the 90 lbs/acre and 180 lbs/acre seeding rates. There was a significant difference in plant stands between the 180 lbs/acre vs. the 90 and 135 lbs/acre seeding rates. Rainfall was below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Seeding Rate

Trial ID: 2021-WP02 — R.M. of Woodlands

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal seeding rate in spring wheat.

TRIAL INFORMATION	
Location	Marquette
Previous Crop	Canola
Soil Texture	Clay
Tillage	Minimal Tillage
Planting Date	April 09, 2021
Variety	AAC Brandon
Row Spacing	10”
Seeding Rate (lbs/ac)	90, 120 & 160
Fertilizer (N-P-K-S)	4N 20P, Swine manure Fall 2020
Harvest Date	August 14, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	36	32	12	14	**95**
Normal	51	65	55	40	**211**

†Growing season precipitation (mm) - May 01—Aug 15

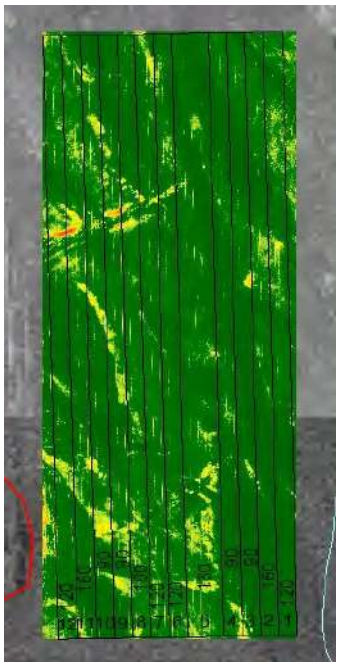
WHEAT RESPONSE

	Plant Stand/ft²	Protein	TWT (kg/hL)	Falling Number
90 lbs/ac	25^{A}	16.1	76	360
120 lbs/ac	25^{A}	15.6	76	380
160 lbs/ac	35^{A}	15.2	79	384

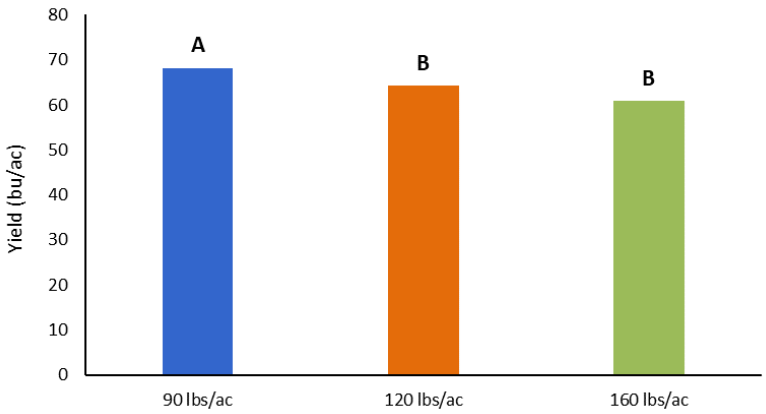
OVERALL YIELD

	Mean (bu/ac)
90 lbs/ac	68.2^{A}
120 lbs/ac	64.3^{B}
160 lbs/ac	60.9^{B}
P-Value	0.0056
CV	3.05%
Significance	**Yes**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was a significant difference in yield between the 90 lbs/acre vs. the 120 lbs/acre and 160 lbs/acre seeding rates. There was no significant difference in plant stands between the three seeding rates. Rainfall was well below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Seeding Rate

Trial ID: 2021-WP03 — R.M. of Grey

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal seeding rate in spring wheat.

TRIAL INFORMATION	
Location	Elm Creek
Previous Crop	Soybeans
Soil Texture	Clay Loams
Tillage	Conventional Tillage
Planting Date	April 10, 2021
Variety	AAC Starbuck VB
Row Spacing	7.5”
Seeding Rate (lbs/ac)	100, 120 & 140
Fertilizer (N-P-K-S)	111N 61P 10S 1%Zn
Harvest Date	August 03, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	50	71	16	23	**160**
Normal	53	74	60	48	**235**

†Growing season precipitation (mm) - May 01—Aug 15

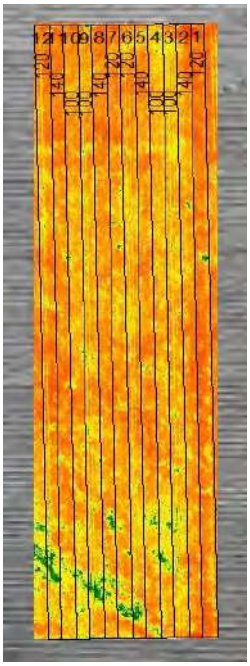
WHEAT RESPONSE

	Plant Stand/ft²	Protein	TWT (kg/hL)	Falling Number
100 lbs/ac	19[A]	17.8	81	367
120 lbs/ac	25[A]	- -	- -	- -
140 lbs/ac	28[A]	- -	- -	- -

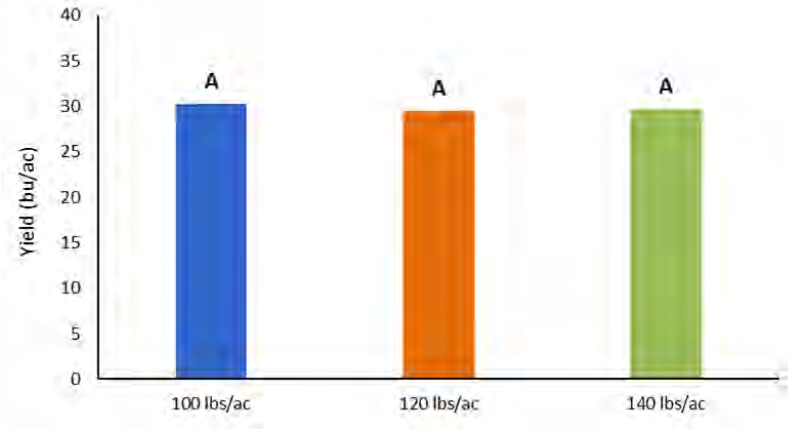
OVERALL YIELD

	Mean (bu/ac)
100 lbs/ac	30.2[A]
120 lbs/ac	29.5[A]
140 lbs/ac	29.7[A]
P-Value	0.5012
CV	2.96%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant difference in yield between the 100 lbs/acre, 120 lbs/acre and 140 lbs/acre seeding rates. There was no significant difference in plant stands between the three seeding rates. Rainfall was well below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Seeding Rate

Trial ID: 2021-WP04 — R.M. of Oakland-Wawanesa

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal seeding rate in spring wheat.

TRIAL INFORMATION

Location	Wawanesa
Previous Crop	Canola
Soil Texture	Clay Loams
Tillage	Zero Tillage
Planting Date	April 27, 2021
Variety	AAC Wheatland VB
Row Spacing	9”
Seeding Rate (lbs/ac)	90, 120 & 150
Fertilizer (N-P-K-S)	120N 45P 25S
Harvest Date	August 15, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	33	71	18	14	**135**
Normal	49	67	76	26	**218**

†Growing season precipitation (mm) - May 01—Aug 15

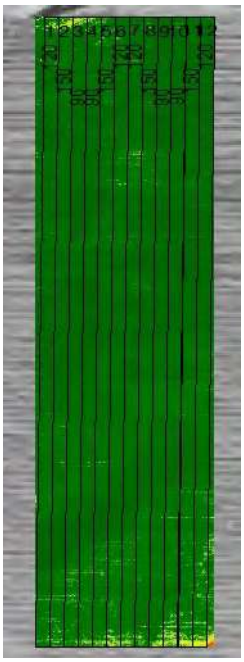
WHEAT RESPONSE

	Plant Stand/ft²	Protein	TWT (kg/hL)	Falling Number
90 lbs/ac	24^{B}	13.5	83	327
120 lbs/ac	32^{AB}	- -	- -	- -
150 lbs/ac	41^{A}	- -	- -	- -

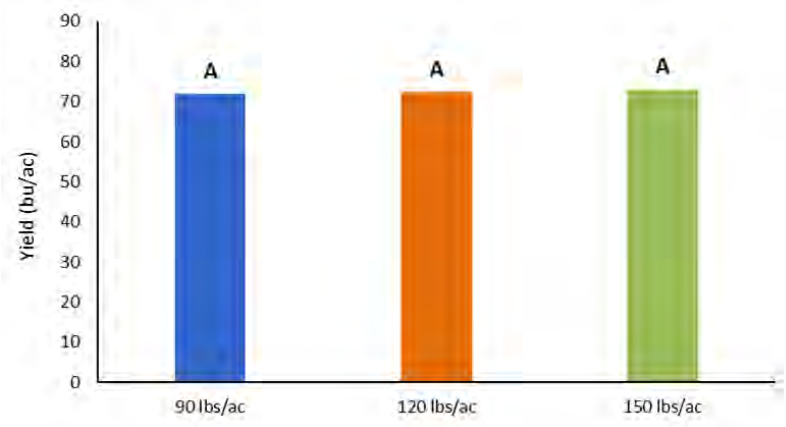
OVERALL YIELD

	Mean (bu/ac)
90 lbs/ac	71.9^{A}
120 lbs/ac	72.5^{A}
150 lbs/ac	73.0^{A}
P-Value	0.1396
CV	0.96%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant difference in yield between the 90 lbs/acre, 120 lbs/acre and 150 lbs/acre seeding rates. There was a significant difference in plant stands between 90 lbs/acre and 150 lbs/acre seeding rates. Rainfall was below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Seeding Rate

Trial ID: 2021-WP05 — R.M. of MacDonald

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal seeding rate in spring wheat.

TRIAL INFORMATION	
Location	Sanford
Previous Crop	Soybeans
Soil Texture	Clay Loams
Tillage	Conventional Tillage
Planting Date	April 28, 2021
Variety	AAC Starbuck VB
Row Spacing	10”
Seeding Rate (lbs/ac)	110, 130 & 150
Fertilizer (N-P-K-S)	132N 40P
Harvest Date	August 07, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	68	57	8	23	**156**
Normal	57	86	75	38	**256**

†Growing season precipitation (mm) - May 01—Aug 15

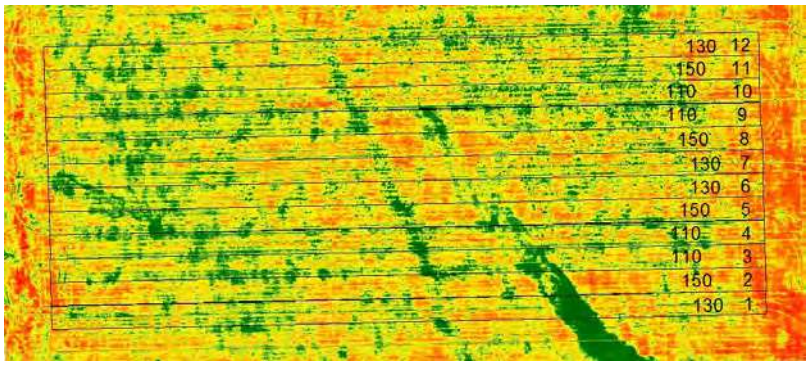
WHEAT RESPONSE

	Plant Stand/ft²	Protein	TWT (kg/hL)	Falling Number
110 lbs/ac	26[A]	16.7	82	370
130 lbs/ac	24[A]	17.1	82	375
150 lbs/ac	24[A]	17	82	344

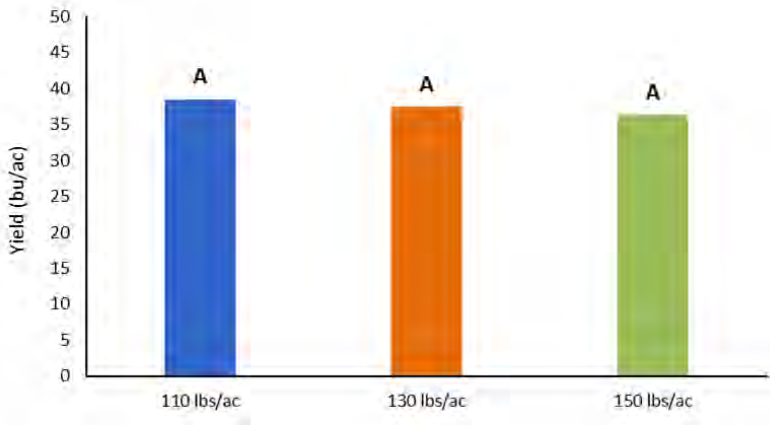
OVERALL YIELD

	Mean (bu/ac)
110 lbs/ac	38.5[A]
130 lbs/ac	37.4[A]
150 lbs/ac	36.4[A]
P-Value	0.1688
CV	3.74%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant difference in yield between the 110lbs/acre, 130 lbs/acre and 150 lbs/acre seeding rates. There was no significant difference in plant stands between the three seeding rates. Rainfall was below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Seeding Rate

Trial ID: 2021-WP06 — R.M. of Morris

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal seeding rate in spring wheat.

TRIAL INFORMATION

Location	Lowe Farm
Previous Crop	Sunflower
Soil Texture	Clay Loams
Tillage	Conventional Tillage
Planting Date	April 28, 2021
Variety	AAC Starbuck VB
Row Spacing	10”
Seeding Rate (lbs/ac)	85, 110 & 135
Fertilizer (N-P-K-S)	126N 26P
Harvest Date	August 30, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	39	49	19	25	**132**
Normal	51	82	65	46	**244**

†Growing season precipitation (mm) - May 01—Aug 15

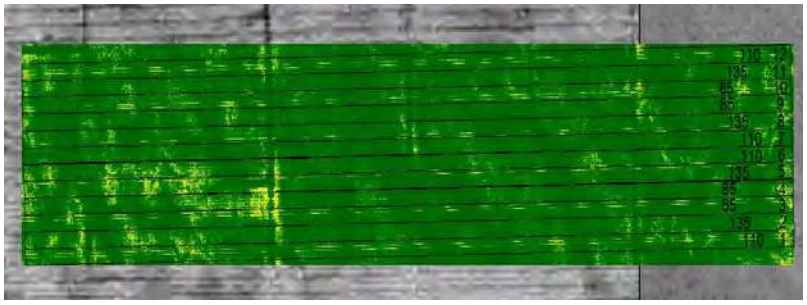
WHEAT RESPONSE

	Plant Stand/ft²	Protein	TWT (kg/hL)	Falling Number
85 lbs/ac	20^{B}	15.6	77	300
110 lbs/ac	21^{B}	15.6	78	284
135 lbs/ac	28^{A}	16.2	77	280

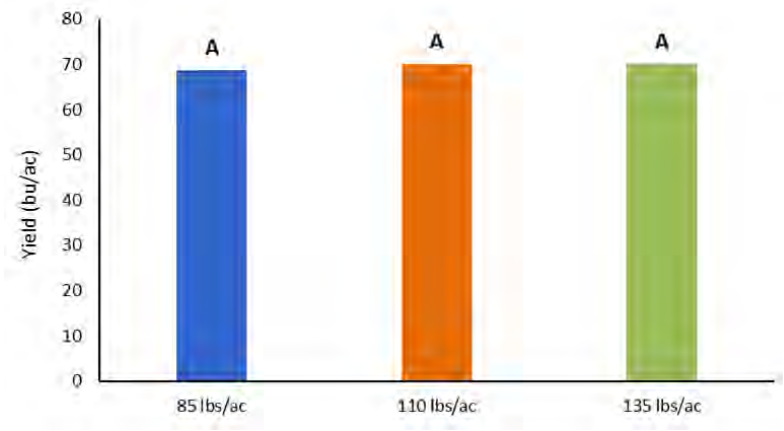
OVERALL YIELD

	Mean (bu/ac)
85 lbs/ac	68.7^{A}
110 lbs/ac	70.1^{A}
135 lbs/ac	69.1^{A}
P-Value	0.1176
CV	1.17%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant difference in yield between the 85 lbs/acre, 110 lbs/acre and 135 lbs/acre seeding rates. There was a significant difference in plant stands between the 135 lbs/acre vs. the 85 lbs/acre and 110 lbs/acre seeding rates. Rainfall was below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Seed Treatment Trial

Objective: The purpose of this project is to quantify the economic and agronomic impacts of using a seed treatment in wheat.

Summary: One site-year showed a significant difference in yield using a seed treatment. The remaining trials showed no effect from the seed treatment.

Single Site Analysis

Trial ID	Rural Municipality	Variety	Yield			CV	P-Value	Statistically Significant @
			Product A	Product B	Untreated			
			bu/ac			%		95%
2021-WST02	Cartwright-Roblin	AAC Brandon	21.4	21.0	21.4	5.07	0.7976	No

Trial ID	Rural Municipality	Variety	Yield		Yield Difference	CV	P-Value	Statistically Significant @
			Treated	Untreated				
			bu/ac		bu/ac	%		95%
2021-WST01	Morris	SY Gabbro	30.0	31.5	-1.5	13.84	0.7113	No
2021-WST03	De Salaberry	AAC Brandon	42.9	44.4	-1.5	8.42	0.5996	No
2021-WST04	Emerson-Franklin	Prosper	56.9	52.4	4.5	7.65	0.2197	No
2021-WST05	De Salaberry	AAC Brandon	62.9	62.8	0.1	1.30	0.7753	No
2021-WST06	MacDonald	Faller	**33.5**[A]	**32.3**[B]	1.2	0.35	0.0006	Yes
2021-WST07	Dauphin	AC Gabriel	49.2	50.0	-0.8	2.74	0.3843	No
2021-WST08	Dauphin	AAC Viewfield	80.6	80.0	0.6	0.67	0.2244	No

Indicates Statistical Difference at 95% confidence interval

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Wheat Seed Treatment

Trial ID: 2021-WST01 — R.M. of Morris

Objective: The purpose of this project is to quantify the impacts of seed treatment in wheat.

TRIAL INFORMATION	
Location	Sperling
Previous Crop	Canola
Soil Texture	Clay
Tillage	Minimal Tillage
Planting Date	April 10, 2021
Variety	SY Gabbro
Row Spacing	7.5”
Seeding Rate	157 lbs/ac
Fertilizer (N-P-K-S)	156N 60P 15S 1%Zn
Harvest Date	July 29, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	60	56	32	28	**177**
Normal	52	82	69	42	**245**

†Growing season precipitation (mm) - May 01—Aug 15

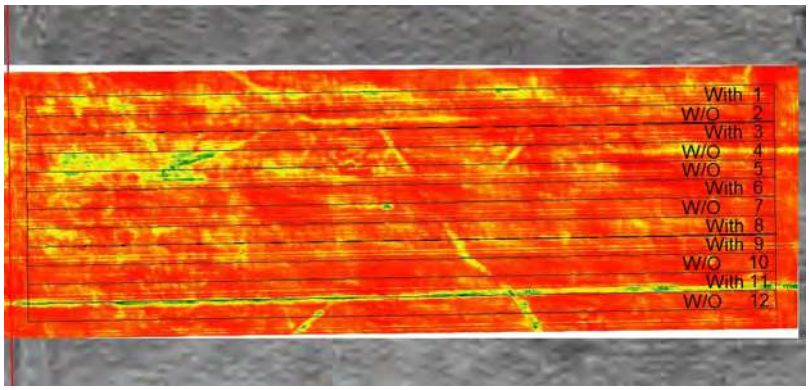
WHEAT RESPONSE

	Plant Stand/ft²	Protein	TWT (kg/hL)	Falling Number
Treated	27[A]	15.3	80	392
Untreated	30[A]	15.1	80	373

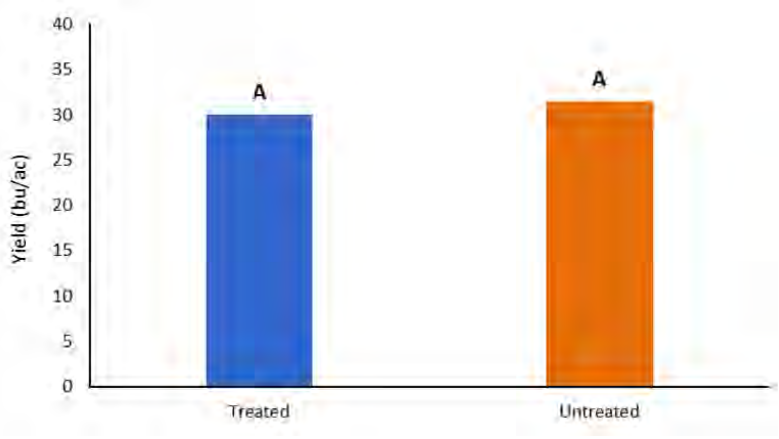
OVERALL YIELD

	Mean (bu/ac)
Treated	30.0[A]
Untreated	31.5[A]
Difference	-1.4
P-Value	0.7113
CV	13.84%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the seed treatment and the untreated check. There was no significant difference in plant stand due to the use of seed treatment. Rainfall was below normal throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Seed Treatment

Trial ID: 2021-WST02 — R.M. of Cartwright-Roblin

Objective: The purpose of this project is to quantify the impacts of two different seed treatments in wheat.

TRIAL INFORMATION

Location	Cartwright
Previous Crop	Soybeans
Soil Texture	Clay Loams
Tillage	Zero Tillage
Planting Date	April 24, 2021
Variety	AAC Brandon
Row Spacing	7.5”
Seeding Rate	120 lbs/ac
Fertilizer (N-P-K-S)	110N 50P 22K
Harvest Date	August 15, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	25	83	13	34	**155**
Normal	60	82	66	45	**254**

†Growing season precipitation (mm) - May 01—Aug 15

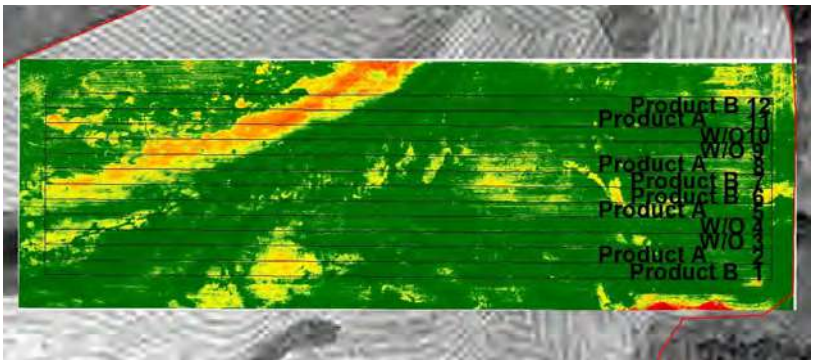
WHEAT RESPONSE

	Plant Stand/ft²	Protein	TWT (kg/hL)	Falling Number
Product A	27[A]	16.3	77	418
Product B	27[A]	14.5	82	341
Untreated	24[A]	14.3	82	359

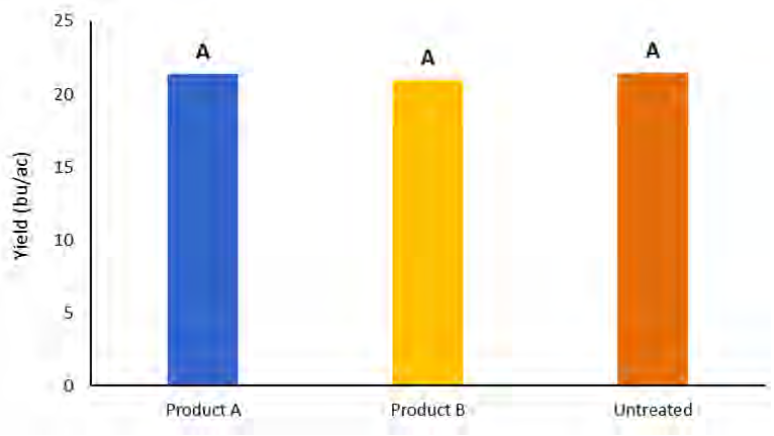
OVERALL YIELD

	Mean (bu/ac)
Product A	21.4[A]
Product B	21.0[A]
Untreated	21.4[A]
P-Value	0.7976
CV	5.07%
Significance	No

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the seed treatments and the untreated check. There was no significant difference in plant stand due to the use of seed treatment. Rainfall was below normal throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Seed Treatment

Trial ID: 2021-WST03 — R.M. of De Salaberry

Objective: The purpose of this project is to quantify the impacts of seed treatment in wheat.

TRIAL INFORMATION	
Location	Otterburne
Previous Crop	Sunflower
Soil Texture	Clay
Tillage	Minimal Tillage
Planting Date	April 25, 2021
Variety	AAC Brandon
Row Spacing	7.5”
Seeding Rate	138 lbs/ac
Fertilizer (N-P-K-S)	163N 60P 50K
Harvest Date	August 08, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	35	61	12	51	**160**
Normal	52	86	63	41	**242**

†Growing season precipitation (mm) - May 01—Aug 15

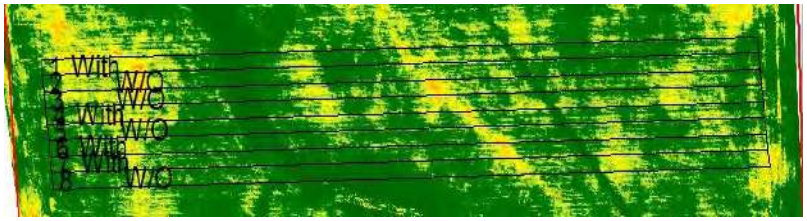
WHEAT RESPONSE

	Plant Stand/ft²	Protein	TWT (kg/hL)	Falling Number
Treated	20[A]	15.0	81	372
Untreated	24[A]	15.2	81	360

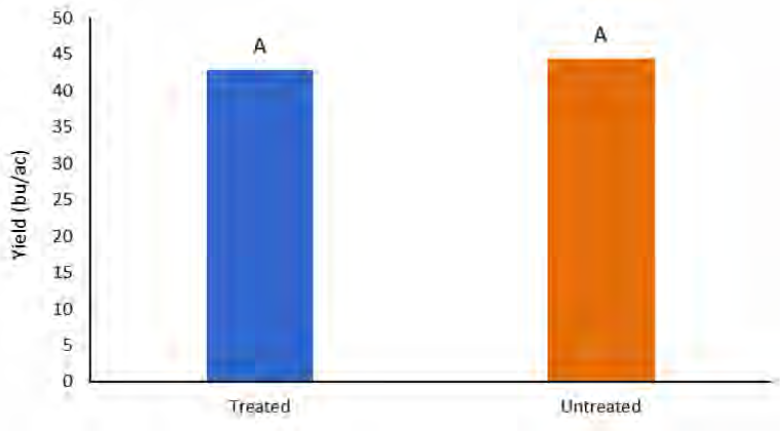
OVERALL YIELD

	Mean (bu/ac)
Treated	42.9[A]
Untreated	44.4[A]
Difference	-1.5
P-Value	0.5996
CV	8.42%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the seed treatment and the untreated check. There was no significant difference in plant stand due to the use of seed treatment. Rainfall was below normal throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Seed Treatment

Trial ID: 2021-WST04 — R.M. of Emerson-Franklin

Objective: The purpose of this project is to quantify the impacts of seed treatment in wheat.

TRIAL INFORMATION	
Location	Ridgeville
Previous Crop	Canola
Soil Texture	Clay Loams
Tillage	Conventional Tillage
Planting Date	April 26, 2021
Variety	Prosper
Row Spacing	7.5”
Seeding Rate	120 lbs/ac
Fertilizer (N-P-K-S)	120N 40P 10K
Harvest Date	August 13, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	21	26	43	28	**117**
Normal	56	82	81	43	**261**

†Growing season precipitation (mm) - May 01—Aug 15

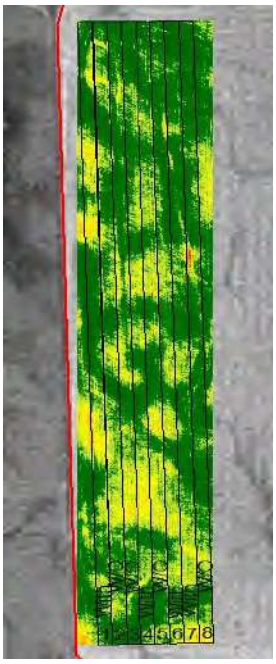
WHEAT RESPONSE

	Plant Stand/ft²	Protein	TWT (kg/hL)	Falling Number
Treated	21[A]	12.7	76	362
Untreated	19[A]	12.6	77	370

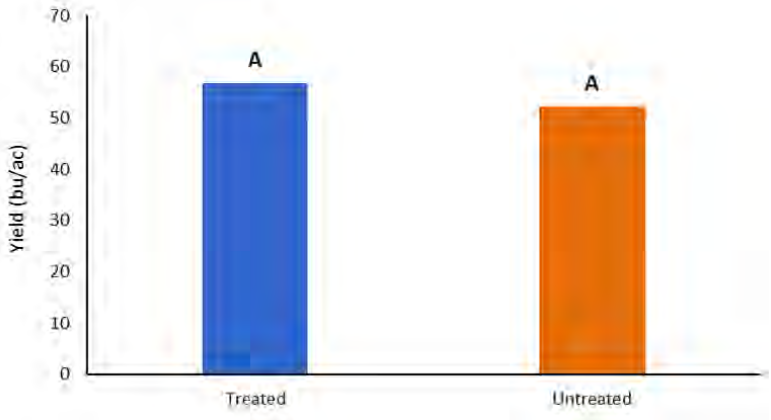
OVERALL YIELD

	Mean (bu/ac)
Treated	56.9[A]
Untreated	52.4[A]
Difference	4.5
P-Value	0.2197
CV	7.65%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the seed treatment and the untreated check. There was no significant difference in plant stand due to the use of seed treatment. Rainfall was well below normal throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Seed Treatment

Trial ID: 2021-WST05 — R.M. of De Salaberry

Objective: The purpose of this project is to quantify the impacts of seed treatment in wheat.

TRIAL INFORMATION	
Location	Otterburne
Previous Crop	Corn
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	April 27, 2021
Variety	AAC Brandon
Row Spacing	10”
Seeding Rate	135 lbs/ac
Fertilizer (N-P-K-S)	130N 30P
Harvest Date	August 08, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	35	61	12	51	**160**
Normal	52	86	63	41	**242**

†Growing season precipitation (mm) - May 01—Aug 15

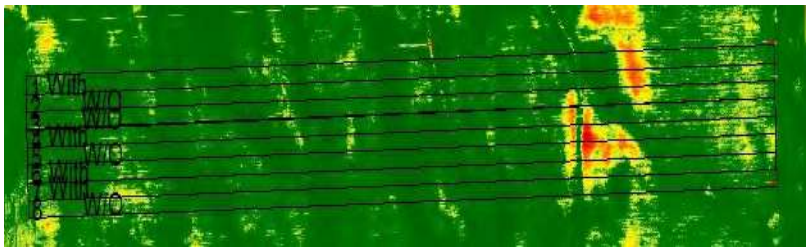
WHEAT RESPONSE

	Plant Stand/ft²	Protein	TWT (kg/hL)	Falling Number
Treated	26[A]	14.7	80	346
Untreated	23[A]	14.9	81	365

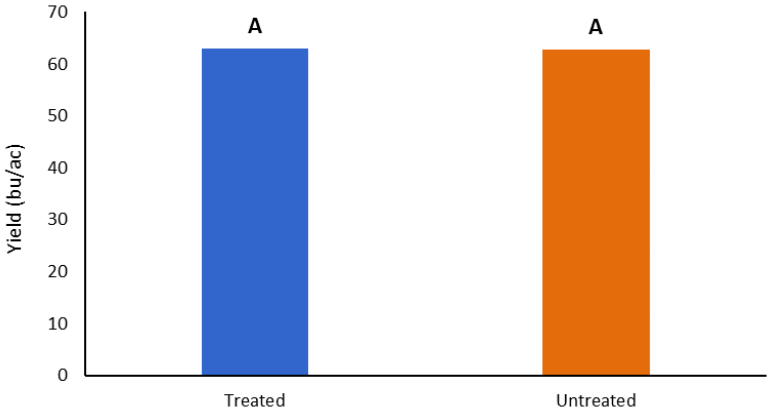
OVERALL YIELD

	Mean (bu/ac)
Treated	62.9[A]
Untreated	62.8[A]
Difference	0.1
P-Value	0.7753
CV	1.30%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the seed treatment and the untreated check. There was no significant difference in plant stand due to the use of seed treatment. Rainfall was below normal throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Seed Treatment

Trial ID: 2021-WST06 — R.M. of MacDonald

Objective: The purpose of this project is to quantify the impacts of seed treatment in wheat.

TRIAL INFORMATION	
Location	Osborne
Previous Crop	Soybeans
Soil Texture	Clay
Tillage	Minimal Tillage
Planting Date	May 01, 2021
Variety	Faller
Row Spacing	10”
Seeding Rate	170 lbs/ac
Fertilizer (N-P-K-S)	152N 35P
Harvest Date	August 06, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	67	57	8	23	**156**
Normal	47	96	75	38	**256**

†Growing season precipitation (mm) - May 01—Aug 15

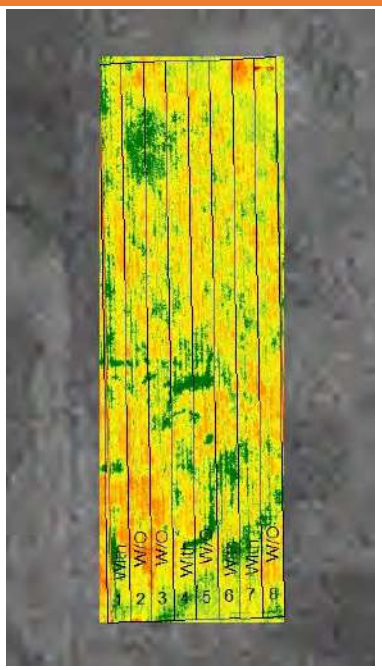
WHEAT RESPONSE

	Plant Stand/ft²	Protein	TWT (kg/hL)	Falling Number
Treated	25^{A}	14.6	77	362
Untreated	31^{A}	15.3	78	360

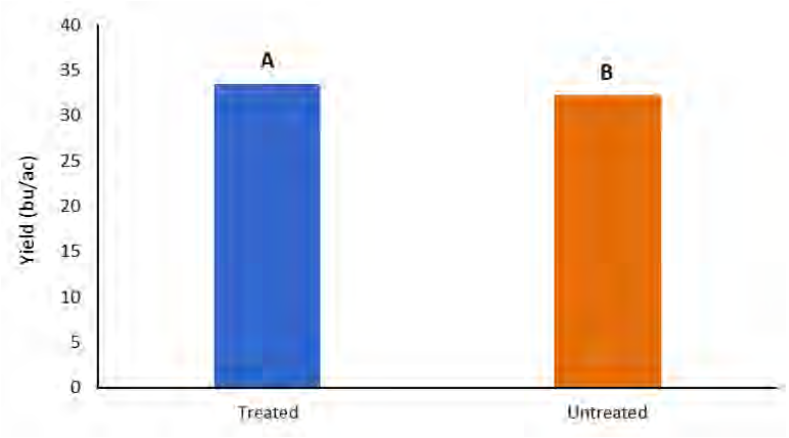
OVERALL YIELD

	Mean (bu/ac)
Treated	33.5^{A}
Untreated	32.3^{B}
Difference	1.2
P-Value	0.0006
CV	0.35%
Significance	**Yes**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was a significant yield difference between the seed treatment and the untreated check. There was no significant difference in plant stand due to the use of seed treatment. Rainfall was well below normal throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Seed Treatment

Trial ID: 2021-WST07 — R.M. of Dauphin

Objective: The purpose of this project is to quantify the impacts of seed treatment in wheat.

TRIAL INFORMATION	
Location	Dauphin
Previous Crop	Soybeans
Soil Texture	Clay
Tillage	Zero Tillage
Planting Date	May 12, 2021
Variety	AC Gabriel
Row Spacing	10”
Seeding Rate	110 lbs/ac
Fertilizer (N-P-K-S)	123N 44P 11S 1%Zn
Harvest Date	August 31, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	24	71	30	8	**132**
Normal	53	80	68	49	**250**

†Growing season precipitation (mm) - May 01—Aug 15

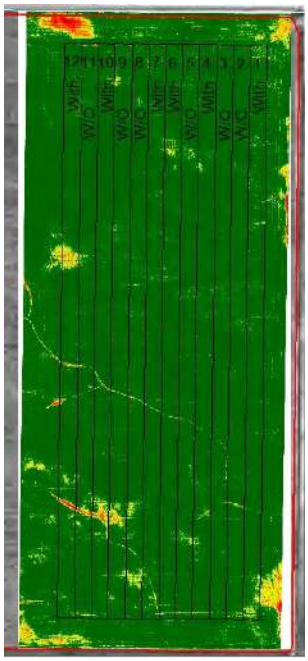
WHEAT RESPONSE

	Plant Stand/ft²	Protein	TWT (kg/hL)	Falling Number
Treated	20[A]	14.4	75	174
Untreated	20[A]	15.0	76	180

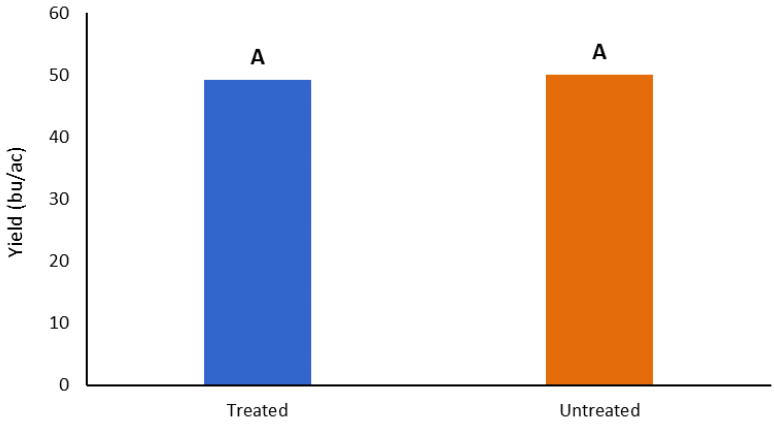
OVERALL YIELD

	Mean (bu/ac)
Treated	49.2[A]
Untreated	50.0[A]
Difference	-0.8
P-Value	0.3843
CV	2.74%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the seed treatment and the untreated check. There was no significant difference in plant stand due to the use of seed treatment. Rainfall was below normal throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Seed Treatment

Trial ID: 2021-WST08 — R.M. of Dauphin

Objective: The purpose of this project is to quantify the impacts of seed treatment in wheat.

TRIAL INFORMATION	
Location	Riding Mountain
Previous Crop	Peas
Soil Texture	Clay
Tillage	Zero Tillage
Planting Date	May 12, 2021
Variety	AAC Viewfield
Row Spacing	10”
Seeding Rate	125 lbs/ac
Fertilizer (N-P-K-S)	131N 50P 20K
Harvest Date	August 31, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	29	91	30	13	**163**
Normal	53	81	68	48	**250**

†Growing season precipitation (mm) - May 01—Aug 15

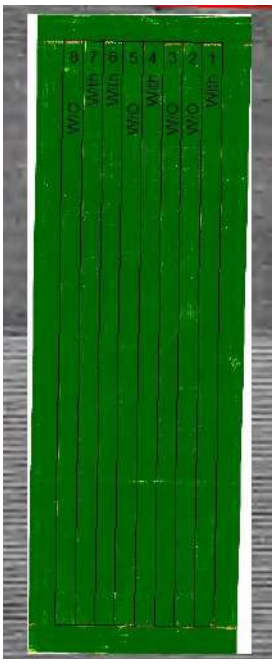
WHEAT RESPONSE

	Plant Stand/ft²	Protein	TWT (kg/hL)	Falling Number
Treated	30[A]	13.4	81	292
Untreated	29[A]	12.9	80	320

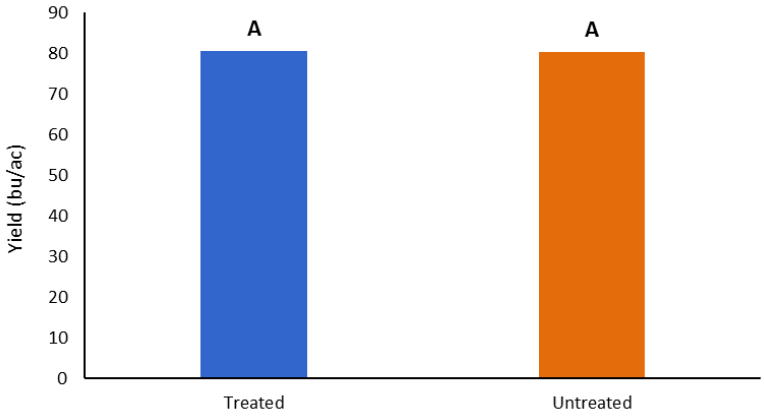
OVERALL YIELD

	Mean (bu/ac)
Treated	80.6[A]
Untreated	80.0[A]
Difference	0.6
P-Value	0.2244
CV	0.67%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the seed treatment and the untreated check. There was no significant difference in plant stand due to the use of seed treatment. Rainfall was below normal throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Fusarium Fungicide Trial

Objective: The purpose of the project (Table 1) is to quantify the impact of fusarium head blight on the quality of harvested grain (Table 2) by comparing a farmer's normal fungicide application at recommended timing to a fungicide application 3-5 days later.

Summary: None of the site-years had a significant yield increase with fusarium fungicide application and the two timings did not significantly differ from one another.

Table 1: Fusarium Fungicide Timing

Trial ID	Rural Municipality	Variety	Yield			CV	P-Value	Statistically Significant @
			Late	Rec'd	Untreated			
			bu/ac			%		95%
2021-WFHB01	De Salaberry	AAC Brandon	54.7	55.6	57.1	2.10	0.3606	No
2021-WFHB02	Ste. Anne	AAC Brandon	44.7	40.5	40.1	7.32	0.1412	No
2021-WFHB03	Grey	Bolles	26.1	26.0	25.5	3.14	0.4928	No
2021-WFHB04	Dauphin	AAC Brandon		73.4	73.5	1.78	0.8563	No

Indicates Statistical Difference at 95% confidence interval

Table 2: Quality Analysis

TrialID	Treatment	Protein	Don	Falling Number	TWT (lbs/bu)
2021-WFHB01	Recommended	15.4	< 0.3	354	79
	Late	15.3	< 0.3	356	79
	Untreated	15.6	< 0.3	347	79
2021-WFHB02	Recommended	18.3	< 0.3	361	73
	Late	17.2	< 0.3	360	74
	Untreated	17.0	< 0.3	347	74
2021-WFHB03	Recommended	18.0	< 0.3	352	80
	Late	17.1	< 0.3	355	80
	Untreated	17.5	< 0.3	366	80
2021-WFHB04	Treated	12.9	< 0.3	343	80
	Untreated	17.1	< 0.3	333	81

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Wheat Fusarium Head Blight Fungicide Timing

Trial ID: 2021-WFHB01— R.M. of De Salaberry

Objective: The purpose of this project is to quantify the impact of fusarium head blight on the quality of harvested grain by comparing the farmer's normal fungicide application at recommended rate and timing to a fungicide application 3 to 5 days later

TRIAL INFORMATION	
Location	St. Pierre
Previous Crop	Canola
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	April 30, 2021
Variety	AAC Brandon
Row Spacing	10"
Seeding Rate	132 lbs/ac
Fungicide Product	Prosaro XTR
Rec'd App Date	June 29, 2021
Rec'd App Timing	GS61 (Early Flower)
3-5 Days Later	July 02, 2021
Harvest Date	August 14, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	35	61	12	51	**160**
Normal	52	86	63	41	**242**

†Growing season precipitation (mm) - May 01—Aug 15

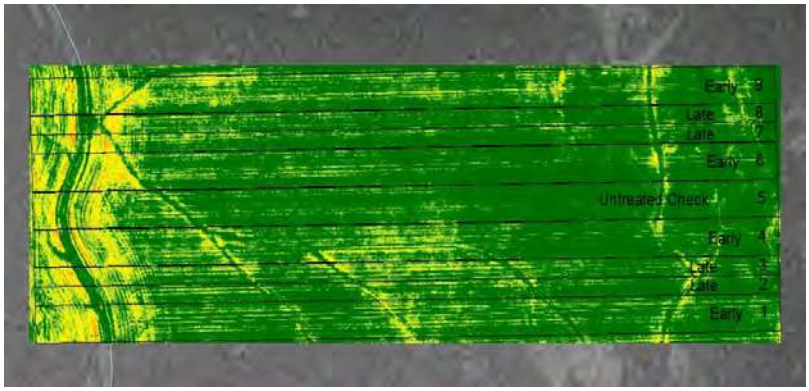
WHEAT QUALITY

	Protein	DON	TWT (kg/hL)	Falling Number
Rec'd Timing	15.4	0.0	79	354
Late Timing	15.3	0.0	79	356
Untreated*	15.6	0.1	79	347

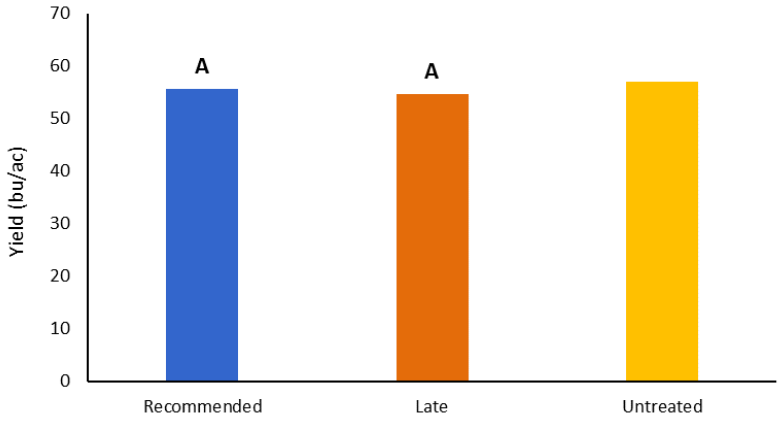
OVERALL YIELD

	Mean (bu/ac)
Rec'd Timing	55.6[A]
Late Timing	54.7[A]
Untreated*	57.1
P-Value	0.3606
CV	2.10%
Significance	No

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the recommended and late timing for the fusarium head blight fungicide applications. Wheat quality was #1 grade for CWRS. Rainfall was well below normal for the growing season.

***Untreated Check was only on Strip 5 and not replicated**

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Fusarium Head Blight Fungicide Timing

Trial ID: 2021-WFHB02— R.M. of Ste. Anne

Objective: The purpose of this project is to quantify the impact of fusarium head blight on the quality of harvested grain by comparing the farmer's normal fungicide application at recommended rate and timing to a fungicide application 3 to 5 days later

TRIAL INFORMATION	
Location	Ste. Anne
Previous Crop	Sunflower
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	May 01, 2021
Variety	AAC Brandon
Row Spacing	10"
Seeding Rate	150 lbs/ac
Fungicide Product	Prosaro XTR
Rec'd App Date	June 30, 2021
Rec'd App Timing	GS61 (Early Flower)
3-5 Days Later	July 03, 2021
Harvest Date	August 13, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	38	58	14	40	**150**
Normal	56	84	77	42	**259**

†Growing season precipitation (mm) - May 01—Aug 15

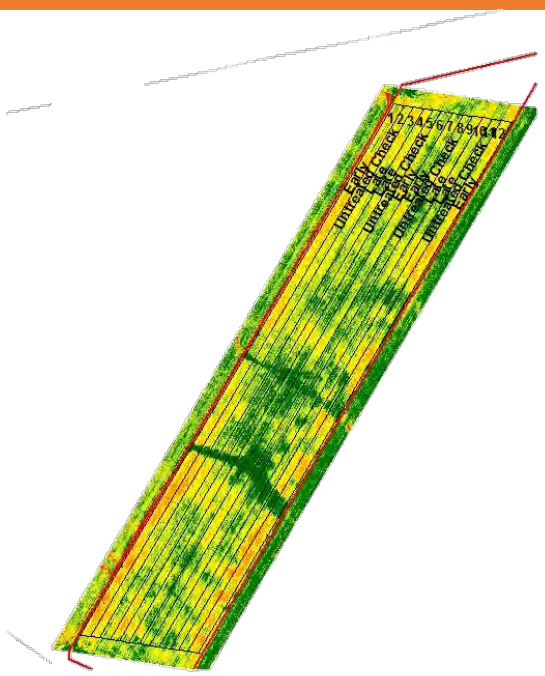
WHEAT QUALITY

	Protein	DON	TWT (kg/hL)	Falling Number
Rec'd Timing	18.3	0.0	73	361
Late Timing	17.2	0.0	74	360
Untreated	17.0	0.0	74	347

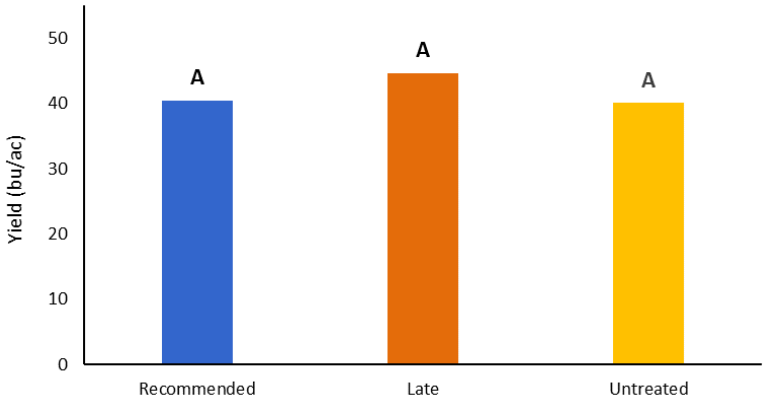
OVERALL YIELD

	Mean (bu/ac)
Rec'd Timing	40.5[A]
Late Timing	44.7[A]
Untreated	40.1[A]
P-Value	0.1412
CV	7.32%
Significance	No

FIELD IMAGE



YIELD BY TREATMENT



Summary: **There was no significant yield difference between the recommended, late timing and untreated check for the fusarium head blight fungicide applications. Wheat quality was #1 grade for CWRS. Rainfall was well below normal for the growing season.**

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Fusarium Head Blight Fungicide Timing

Trial ID: 2021-WFHB03— R.M. of Grey

Objective: The purpose of this project is to quantify the impact of fusarium head blight on the quality of harvested grain by comparing the farmer's normal fungicide application at recommended rate and timing to a fungicide application 3 to 5 days later

TRIAL INFORMATION	
Location	Elm Creek
Previous Crop	Oats
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	April 09, 2021
Variety	Bolles
Row Spacing	10"
Seeding Rate	135 lbs/ac
Fungicide Product	Prosaro XTR
Rec'd App Date	June 30, 2021
Rec'd App Timing	GS61 (Early Flower)
3-5 Days Later	July 07, 2021
Harvest Date	July 30, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	50	71	16	23	**160**
Normal	53	74	60	48	**235**

†Growing season precipitation (mm) - May 01—Aug 15

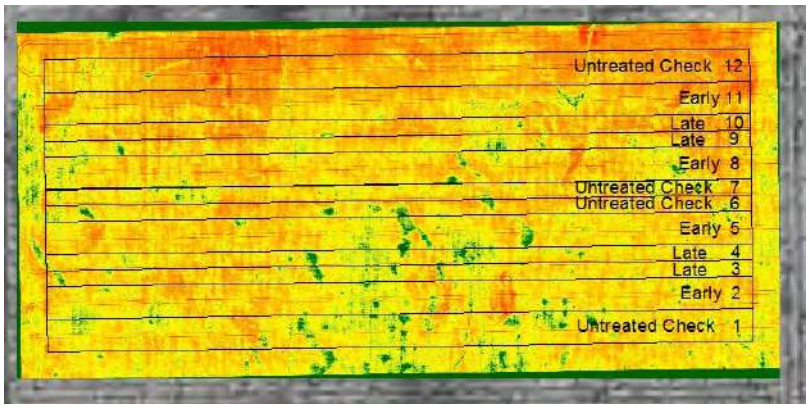
WHEAT QUALITY

	Protein	DON	TWT (kg/hL)	Falling Number
Rec'd Timing	18.0	0.0	80	352
Late Timing	17.1	0.0	80	355
Untreated	17.5	0.1	81	366

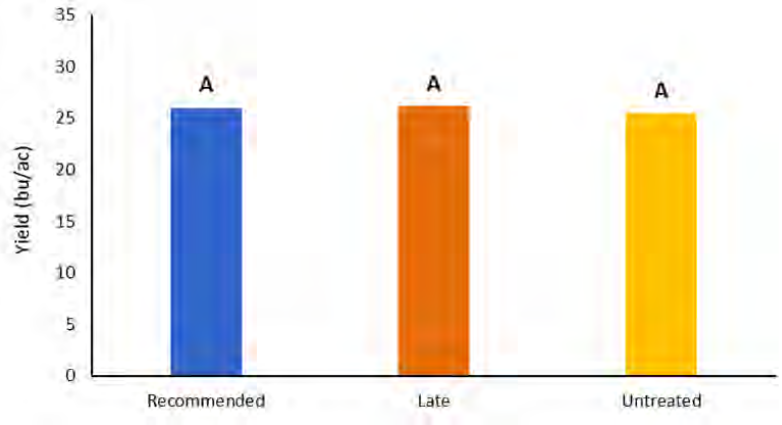
OVERALL YIELD

	Mean (bu/ac)
Rec'd Timing	26.0^{A}
Late Timing	26.1^{A}
Untreated	25.5^{A}
P-Value	0.4928
CV	3.14%
Significance	No

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant yield difference between the recommended, late timing and untreated check for the fusarium head blight fungicide applications. Wheat quality was #1 grade for CWRS. Rainfall was average before fungicide application and extremely below normal following application until harvest.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Wheat Fusarium Head Blight Fungicide Timing

Trial ID: 2021-WFHB04— R.M. of Dauphin

Objective: The purpose of this project is to quantify the impact of fusarium head blight on the quality of harvested grain by comparing the farmer's normal fungicide application with no treatment

TRIAL INFORMATION	
Location	Dauphin
Previous Crop	Canola
Soil Texture	Fine Loams
Tillage	Zero Tillage
Planting Date	April 29, 2021
Variety	AAC Brandon
Row Spacing	10"
Seeding Rate	135 lbs/ac
Fungicide Product	Prosaro XTR
App Date	July 04, 2021
App Timing	GS65 (Mid-flower)
Harvest Date	August 13, 2021

FIELD IMAGE

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	24	71	30	8	**132**
Normal	53	80	68	49	**250**

†Growing season precipitation (mm) - May 01—Aug 15

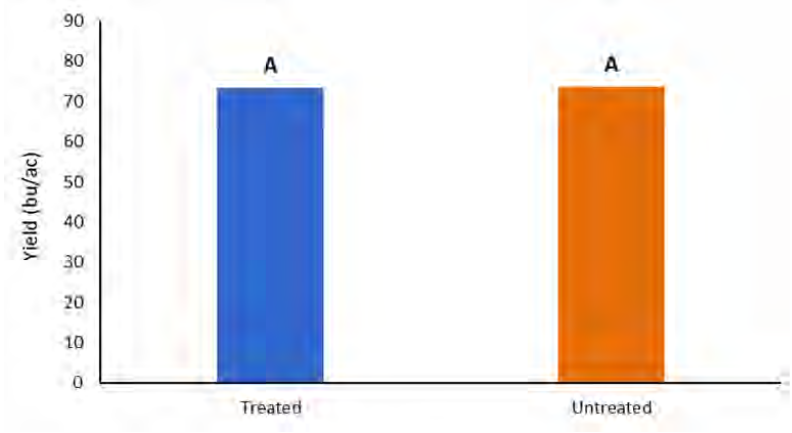
WHEAT QUALITY

	Protein	DON	TWT (kg/hL)	Falling Number
Treated	12.9	0.05	80	343
Untreated	12.5	0.05	81	333

OVERALL YIELD

	Mean (bu/ac)
Treated	73.4[A]
Untreated	73.5[A]
P-Value	0.8563
CV	1.78%
Significance	No

YIELD BY TREATMENT



Summary: There was no significant yield difference between the recommended and untreated check for the fusarium head blight fungicide application. Wheat quality was #1 grade for CWRS. Rainfall was well below normal for the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and SGS Canada Inc. for the wheat quality analysis for this trial.

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Malt Barley Variety Trial

Objective: The purpose of this project is to quantify the agricultural characteristics and malting quality of barley varieties across Manitoba.

Summary: Three site-years showed a significant difference in yield, plant stand and germination. All varieties except CDC Bow had good germination and met malting quality.

Single Site Analysis

Trial ID	Rural Municipality	Variety	Pland Stand	Yield	Protein	Germination	CV	P-Value	Statistically Significant @
			/ft^2	bu/ac	%	%	%		95%
2021-BV02	Morris	AAC Synergy	19	90.2	13.2	98.8	6.60	0.2444	No
		AAC Connect	16	83.2	13.5	98.8			
		CDC Churchill	23	92.4	13.0	98.2			
2021-BV03	Westlake-Gladstone	AAC Synergy	18	18.7^B	15.5	97.7	4.38	0.0009	Yes
		CDC Bow	16	14.8^C	16.0	94.5			
		CDC Copper	12	22.5^A	15.6	97.3			
2021-BV04	Oakland-Wawanesa	AAC Synergy	17	92.7^A	12.0	99.5	2.73	0.0127	Yes
		AAC Connect	20	87.7^B	12.8	99.4			
		CDC Fraser	22	85.3^B	12.1	99.5			
2021-BV05	Victoria	AAC Synergy	14	95.0^A	12.5	97.8	3.21	0.0386	Yes
		AAC Connect	14	87.6^B	13.8	98.9			

Indicates Statistical Difference at 95% confidence interval

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Variety Trial—Malt Barley

Trial ID: 2021-BV02 — R.M. of Morris

Objective: The purpose of this project is to quantify the agricultural characteristics and malting quality of barley varieties across Manitoba.

TRIAL INFORMATION	
Location	Lowe Farm
Previous Crop	Soybeans
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	April 27, 2021
Varieties	AAC Synergy AAC Connect CDC Churchill
Row Spacing	9”
Seeding Rate	110 lbs/ac
Fertilizer (N-P-K-S)	109N 74P 74K 19S
Harvest Date	August 18, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	60	56	32	28	**177**
Normal	52	82	69	42	**245**

†Growing season precipitation (mm) - May 01—Aug 15

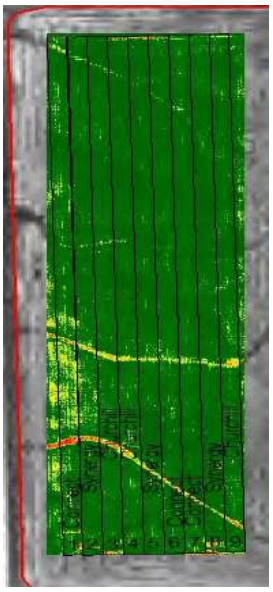
BARLEY QUALITY

	Plant Stand/ft^2	Protein (%)	Germination (%)
AAC Synergy	19^A	13.2	98.8
AAC Connect	16^A	13.5	98.8
CDC Churchill	23^A	13.0	98.2

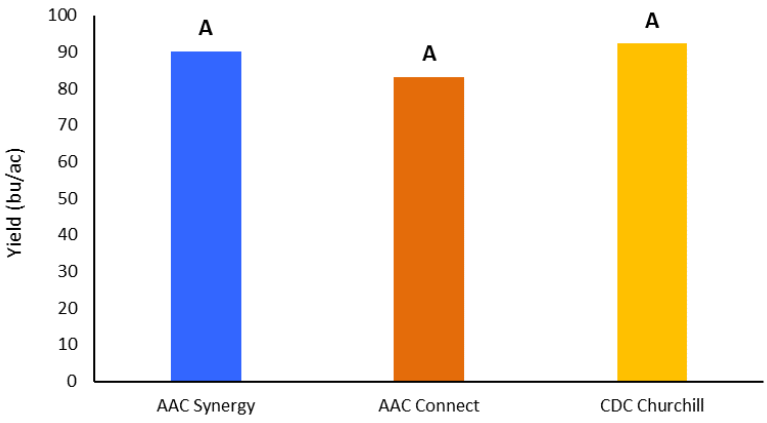
OVERALL YIELD

	Mean (bu/ac)
AAC Synergy	90.2^A
AAC Connect	83.2^A
CDC Churchill	92.4^A
P-Value	0.2444
CV	6.60%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant difference in yield or plant stand between the three varieties. Rainfall was below normal for the growing season. Germination was excellent and all three varieties made malting quality.

MCA and CMBTC would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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Variety Trial—Malt Barley

Trial ID: 2021-BV03 — R.M. of Westlake-Gladstone

Objective: The purpose of this project is to quantify the agricultural characteristics and malting quality of barley varieties across Manitoba.

TRIAL INFORMATION	
Location	Westbourne
Previous Crop	Canola
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	April 28, 2021
Varieties	AAC Synergy CDC Bow CDC Copper
Row Spacing	10”
Seeding Rate	110 lbs/ac
Fertilizer (N-P-K-S)	50N 42P, Poultry manure Spring 2021
Harvest Date	August 13, 2021

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	36	48	9	18	**110**
Normal	50	68	67	49	**235**

†Growing season precipitation (mm) - May 01—Aug 15

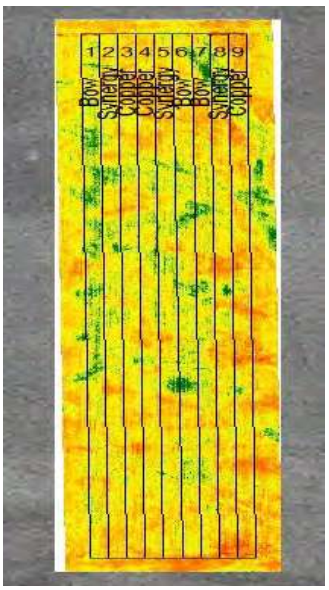
BARLEY QUALITY

	Plant Stand/ft^2	Protein (%)	Germination (%)
AAC Synergy	18^A	15.5	97.7
CDC Bow	16^A	16.0	94.5
CDC Copper	12^A	15.6	97.3

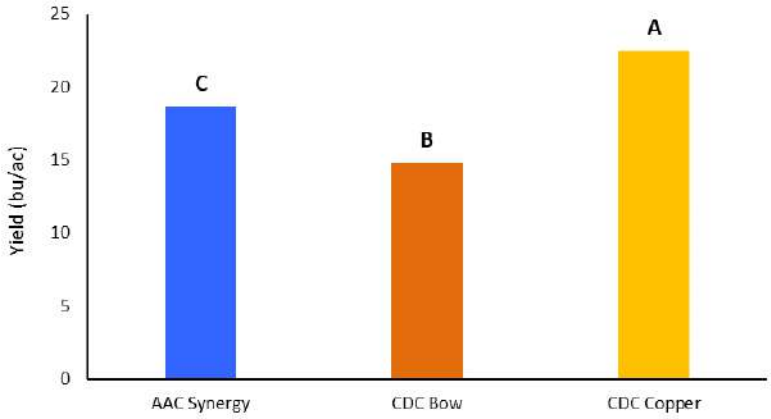
OVERALL YIELD

	Mean (bu/ac)
AAC Synergy	18.7^B
CDC Bow	14.8^C
CDC Copper	22.5^A
P-Value	0.0009
CV	4.38%
Significance	**Yes**

FIELD IMAGE



YIELD BY TREATMENT



Summary: **There was a significant difference in yield between the three varieties. There was no significant difference in plant stand. Rainfall was well below normal for the growing season. Germination was good for both AAC Synergy and CDC Copper which made malting quality. Germination for CDC Bow did not meet malting quality.**

MCA and CMBTC would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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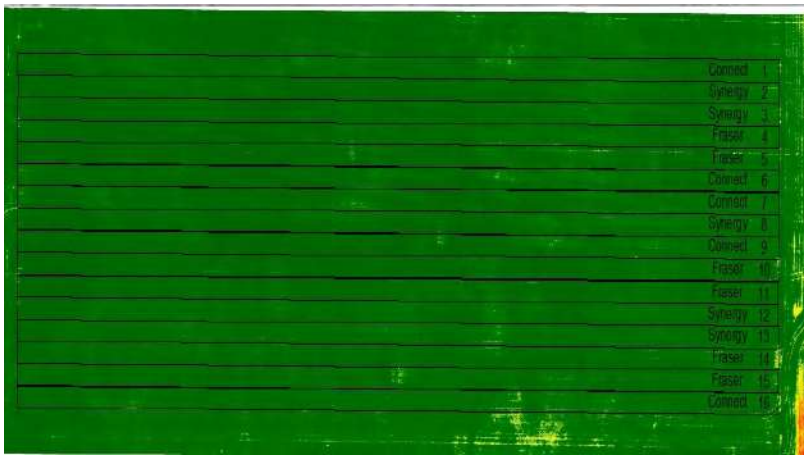
Variety Trial—Malt Barley

Trial ID: 2021-BV04 — R.M. of Oakland-Wawanesa

Objective: The purpose of this project is to quantify the agricultural characteristics and malting quality of barley varieties across Manitoba.

TRIAL INFORMATION	
Location	Wawanesa
Previous Crop	Canola
Soil Texture	Fine Loams
Tillage	Minimal Tillage
Planting Date	April 29, 2021
Varieties	AAC Synergy AAC Connect CDC Fraser
Row Spacing	10”
Seeding Rate	90 lbs/ac
Fertilizer (N-P-K-S)	81N 30P
Harvest Date	August 06, 2021

FIELD IMAGE

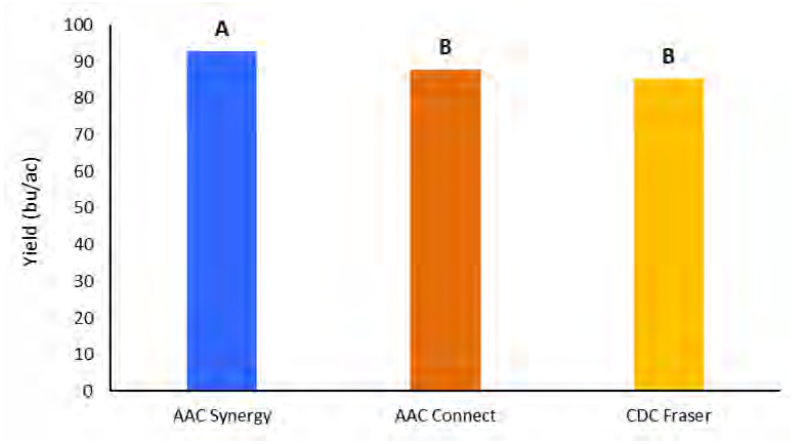


PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	33	71	18	14	**135**
Normal	49	67	76	26	**218**

†Growing season precipitation (mm) - May 01—Aug 15

YIELD BY TREATMENT



BARLEY QUALITY

	Plant Stand/ft^2	Protein (%)	Germination (%)
AAC Synergy	17^A	12.0	99.5
AAC Connect	20^A	12.8	99.4
CDC Fraser	22^A	12.1	99.5

OVERALL YIELD

	Mean (bu/ac)
AAC Synergy	92.7^A
AAC Connect	87.7^B
CDC Fraser	85.3^B
P-Value	0.0127
CV	2.73%
Significance	**Yes**

Summary: **There was a significant difference in yield between AAC Synergy compared to AAC Connect and CDC Fraser. There was no significant difference in plant stand between varieties. Rainfall was well below normal for the growing season. Germination was excellent and all three varieties made malting quality.**

MCA and CMBTC would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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Variety Trial—Malt Barley

Trial ID: 2021-BV05 — R.M. of Victoria

Objective: The purpose of this project is to quantify the agricultural characteristics and malting quality of barley varieties across Manitoba.

TRIAL INFORMATION	
Location	Holland
Previous Crop	Sunflower
Soil Texture	Fine Loams
Tillage	Conventional Tillage
Planting Date	May 10, 2021
Varieties	AAC Synergy AAC Connect
Row Spacing	7.5”
Seeding Rate	96 lbs/ac
Fertilizer (N-P-K-S)	88N 40P 10K
Harvest Date	August 06, 2021

FIELD IMAGE

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	77	73	19	24	**194**
Normal	60	82	81	43	**266**

†Growing season precipitation (mm) - May 01—Aug 15

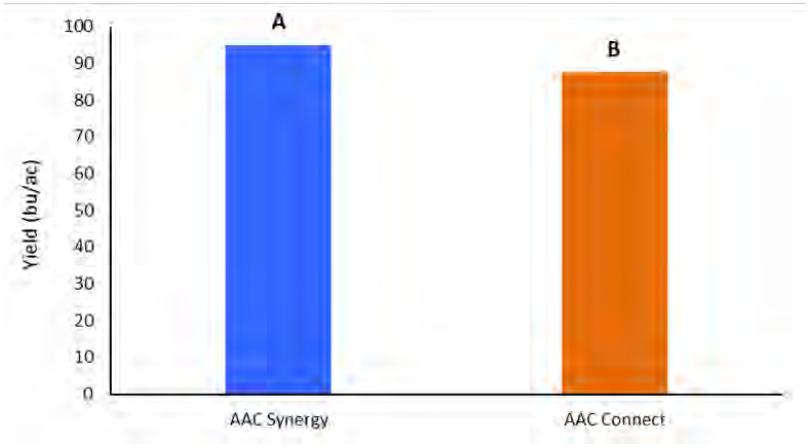
BARLEY QUALITY

	Plant Stand/ft^2	Protein (%)	Germination (%)
AAC Synergy	14^A	12.5	97.8
AAC Connect	14^A	13.8	98.9

OVERALL YIELD

	Mean (bu/ac)
AAC Synergy	95.0^A
AAC Connect	87.6^B
P-Value	0.0386
CV	3.21%
Significance	**Yes**

YIELD BY TREATMENT



Summary: There was a significant difference in yield between the two varieties. There was no significant difference in plant stand. Rainfall was below normal for the growing season. Germination was excellent and both varieties made malting quality.

MCA and CMBTC would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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Corn Planting Rate Trial

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in corn.

Summary: None of the site-years showed a significant yield difference between the three planting rates.

Single Site Analysis

Trial ID	Rural Municipality	Seed Rate (check)	Plant Stand @ V2			Yield			CV	P-Value	Statistically Significant @
			Low Seed Rate	Check Seed Rate	High Seed Rate	Low Seed Rate	Check Seed Rate	High Seed Rate			
		seeds/ac	seeds/ac			bu/ac			%		95%
2021-CRNP01	Dufferin	34,000	31,500	35,000	36,500	150.2	150.0	149.5	2.53	0.9710	No
2021-CRNP02	Hanover	33,000	29,000	31,000	34,250	49.6	63.4	49.6	15.89	0.1004	No
2021-CRNP03	Brokenhead	32,000	26,500	29,000	29,000	106.5	108.0	109.5	4.17	0.6525	No
2021-CRNP04	North Norfolk	34,000	26,250	29,250	32,000	142.3	147.2	148.2	3.02	0.2085	No
2021-CRNP05	Grey	32,000	21,000	25,750	28,250	126.1	128.8	133.9	6.88	0.4931	No
2021-CRNP06	Stanley	33,800	28,250	32,750	33,750	128.4	132.4	138.4	7.07	0.5318	No
2021-CRNP07	Rhineland	38,000	35,000	35,500	34,250	122.3	130.3	135.0	5.45	0.1976	No
2021-CRNP08	North Norfolk	32,000	27,750	31,750	35,750	91.9	86.7	85.7	4.88	0.1735	No
2021-CRNP09A	Springfield	35,000	32,500	33,000	38,000	103.1	102.7	105.0	8.50	0.9282	No
2021-CRNP09B	Springfield	35,000	32,500	33,000	38,000	96.5	99.9	94.6	4.12	0.2439	No
2021-CRNP10	Brokenhead	34,000	30,667	33,667	35,667	89.7	90.2	86.1	6.80	0.6886	No
2021-CRNP11	Ritchot	34,269	29,250	33,000	35,250	101.8	99.3	96.7	9.15	0.7450	No

Indicates Statistical Difference at 95% confidence interval

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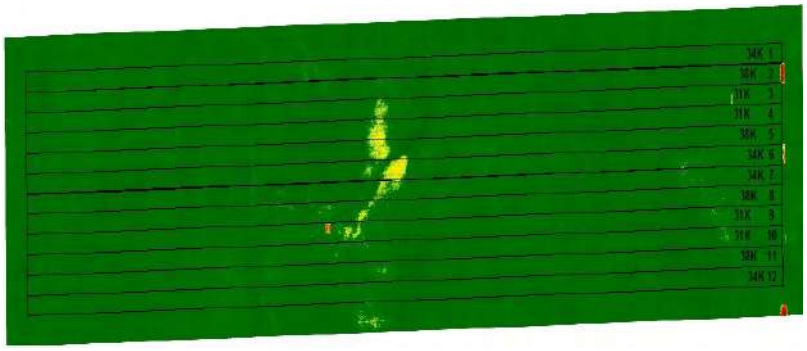
Corn Planting Rate

Trial ID: 2021-CRNP01 — R.M. of Dufferin

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in corn.

TRIAL INFORMATION	
Location	Carman
Previous Crop	Wheat
Soil Texture	Coarse Loams
Tillage	Zero Tillage
Planting Date	May 08, 2021
Fertilizer (N-P-K-S)	153N 40P 40K 10S
Variety	A4939G2 R9B
Row Spacing	20”
Planting Rate (seeds/ac)	31K, 34K & 38K
Harvest Date	October 19, 2021

FIELD IMAGE



SOIL PROPERTIES†			
N 0-24”	**P (ppm)**	**K (ppm)**	**% O.M.**
50	8	78	1.6

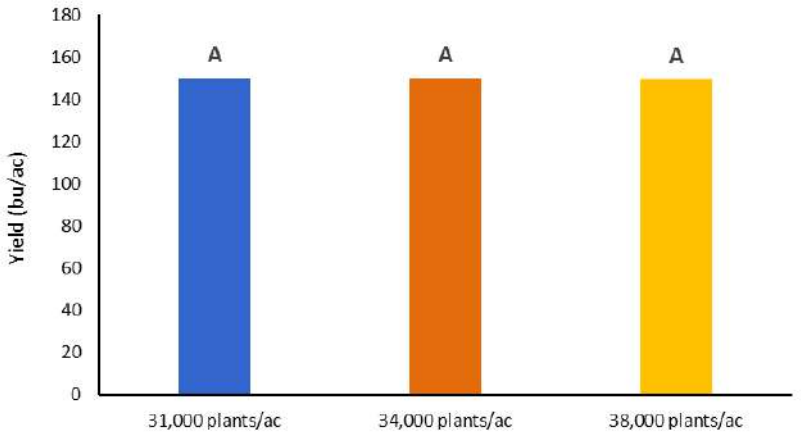
†Nutrient values prior to spring seeding

PLANT STAND @ V2			
Planting Rate (seeds/ac)	31,000	34,000	38,000
Plants/acre	31,500	35,000	36,500

PRECIPITATION†					
	May	**June**	**July**	**Aug**	**Total**
Rainfall	29	104	16	79	**229**
Normal	53	74	60	82	**269**

†Growing season precipitation (mm) - May 01—Aug 31

YIELD BY TREATMENT



OVERALL YIELD	
	Mean (bu/ac)
31,000 plants/ac	150.2[A]
34,000 plants/ac	150.0[A]
38,000 plants/ac	149.5[A]
P-Value	0.9710
CV	2.53%
Significance	**No**

Summary: There was no significant difference in yield or plant stands at V2 between the 31,000, 34,000 and 38,000 seeds/acre planting rates. Rainfall was below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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Corn Planting Rate

Trial ID: 2021-CRNP02 — R.M. of Hanover

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in corn.

TRIAL INFORMATION	
Location	Grunthal
Previous Crop	Corn
Soil Texture	Clay Loams
Tillage	Conventional Tillage
Planting Date	April 28, 2021
Fertilizer (N-P-K-S)	165N
Variety	P7861AM
Row Spacing	30”
Planting Rate (seeds/ac)	30K, 33K & 36K
Harvest Date	October 29, 2021

SOIL PROPERTIES†

N 0-24”	P (ppm)	K (ppm)	% O.M.
284	104	295	4.1

†Nutrient values prior to spring seeding

PLANT STAND @ V2

Planting Rate (seeds/ac)	30,000	33,000	36,000
Plants/acre	29,000	31,000	34,250

PRECIPITATION†

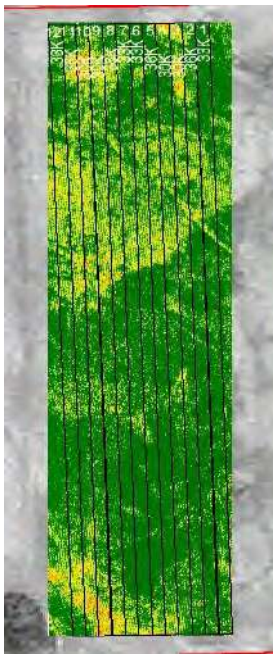
	May	June	July	Aug	Total
Rainfall	35	61	12	108	**216**
Normal	52	86	63	66	**267**

†Growing season precipitation (mm) - May 01—Aug 31

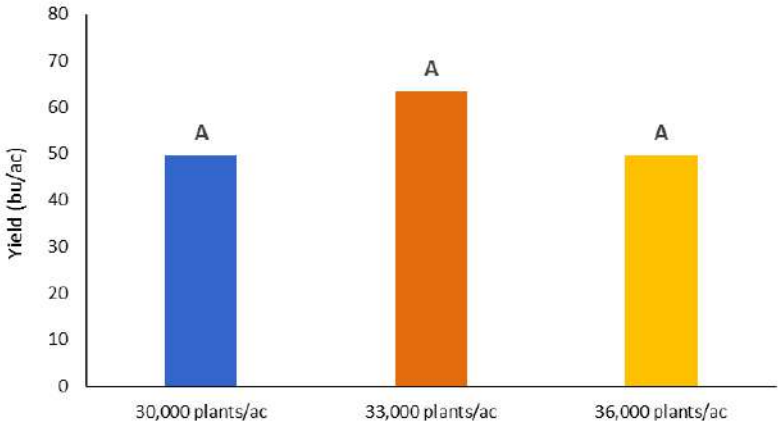
OVERALL YIELD

	Mean (bu/ac)
30,000 plants/ac	49.6^{A}
33,000 plants/ac	63.4^{A}
36,000 plants/ac	49.6^{A}
P-Value	0.1004
CV	15.89%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant difference in yield or plant stands at V2 between the 30,000, 33,000 and 36,000 seeds/acre planting rates. Rainfall was well below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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Corn Planting Rate

Trial ID: 2021-CRNP03 — R.M. of Brokenhead

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in corn.

TRIAL INFORMATION	
Location	Beausejour
Previous Crop	Soybeans
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	May 03, 2021
Fertilizer (N-P-K-S)	190N 53P
Variety	P7211AM
Row Spacing	20”
Planting Rate (seeds/ac)	29K, 32K & 35K
Harvest Date	October 22, 2021

SOIL PROPERTIES†

N 0-24”	P (ppm)	K (ppm)	% O.M.
56	12	332	5.2

†Nutrient values prior to spring seeding

PLANT STAND @ V2

Planting Rate (seeds/ac)	29,000	32,000	35,000
Plants/acre	26,500	29,000	29,000

PRECIPITATION†

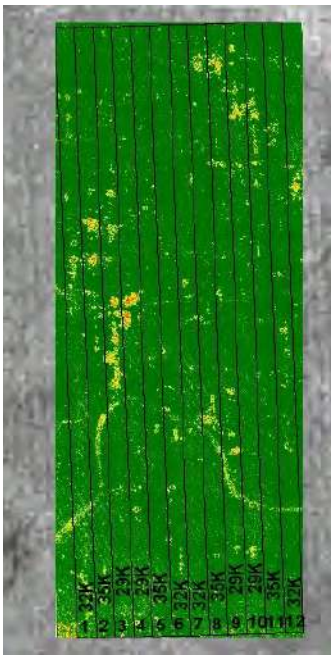
	May	June	July	Aug	Total
Rainfall	52	26	24	91	**192**
Normal	51	85	71	76	**283**

†Growing season precipitation (mm) - May 01—Aug 31

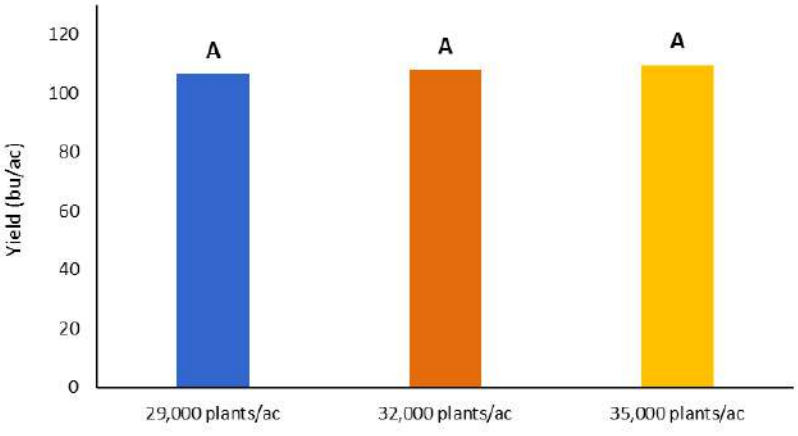
OVERALL YIELD

	Mean (bu/ac)
29,000 plants/ac	106.5^{A}
32,000 plants/ac	108.0^{A}
35,000 plants/ac	109.5^{A}
P-Value	0.6525
CV	4.17%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant difference in yield or plant stands at V2 between the 29,000, 32,000 and 35,000 seeds/acre planting rates. Rainfall was well below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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Corn Planting Rate

Trial ID: 2021-CRNP04 — R.M. of North Norfolk

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in corn.

TRIAL INFORMATION	
Location	MacGregor
Previous Crop	Dry Beans
Soil Texture	Fine Loams
Tillage	Strip Till
Planting Date	May 03, 2021
Fertilizer (N-P-K-S)	138N 40P 60K
Variety	TH6977 VT2P
Row Spacing	30”
Planting Rate (seeds/ac)	31K, 34K & 37K
Harvest Date	October 20, 2021

SOIL PROPERTIES†			
N 0-24”	**P (ppm)**	**K (ppm)**	**% O.M.**
77	10	164	2.8

†Nutrient values prior to spring seeding

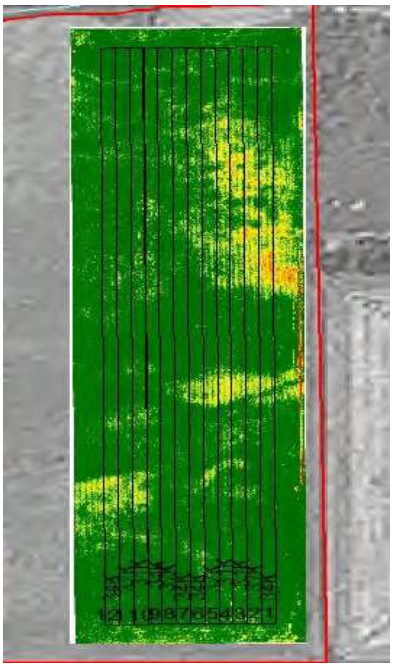
PLANT STAND @ V2			
Planting Rate (seeds/ac)	31,000	34,000	37,000
Plants/acre	26,250	29,250	32,000

PRECIPITATION†					
	May	**June**	**July**	**Aug**	**Total**
Rainfall	52	69	5	97	**222**
Normal	50	76	64	78	**268**

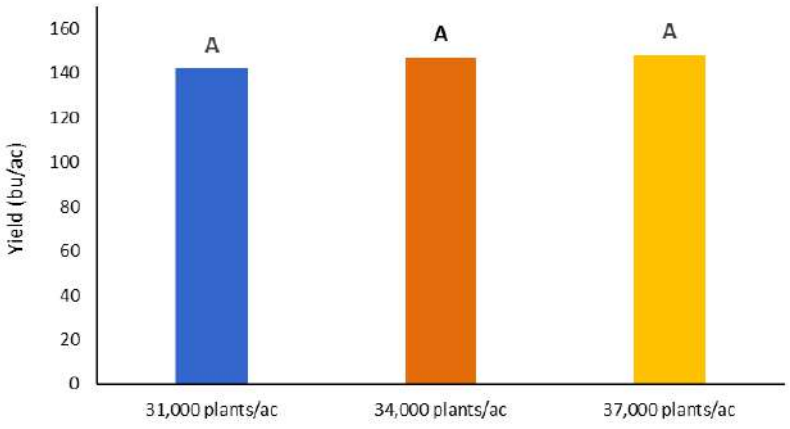
†Growing season precipitation (mm) - May 01—Aug 31

OVERALL YIELD	
	Mean (bu/ac)
31,000 plants/ac	142.3^{A}
34,000 plants/ac	147.2^{A}
37,000 plants/ac	148.2^{A}
P-Value	0.2085
CV	3.02%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant difference in yield between the 31,000, 34,000 and 37,000 seeds/acre planting rates. There was a significant difference in plant stands between the three planting rates taken at V2. Rainfall was below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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Corn Planting Rate

Trial ID: 2021-CRNP05 — R.M. of Grey

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in corn.

TRIAL INFORMATION	
Location	Elm Creek
Previous Crop	Corn
Soil Texture	Coarse Loams
Tillage	Strip Till
Planting Date	May 04, 2021
Fertilizer (N-P-K-S)	142N 40P 40K 10S 1%Zn
Variety	DKC33-78RIB
Row Spacing	30”
Planting Rate (seeds/ac)	29K, 32K & 35K
Harvest Date	October 18, 2021

SOIL PROPERTIES†

N 0-24”	P (ppm)	K (ppm)	% O.M.
85	28	126	2.3

†Nutrient values prior to spring seeding

PLANT STAND @ V2

Planting Rate (seeds/ac)	29,000	32,000	35,000
Plants/acre	21,000	25,750	28,250

PRECIPITATION†

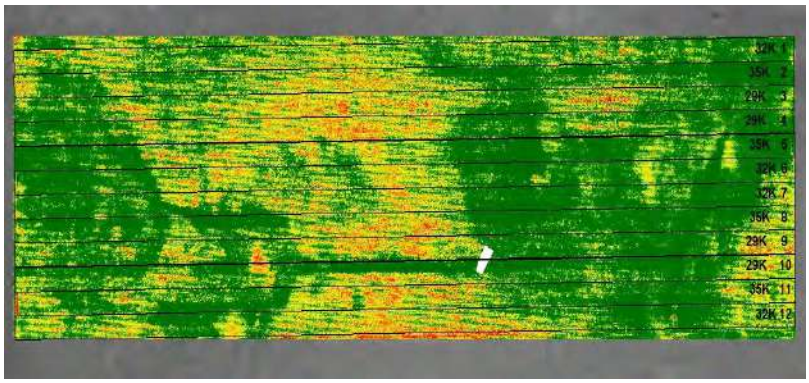
	May	June	July	Aug	Total
Rainfall	50	71	16	73	**210**
Normal	53	74	60	82	**269**

†Growing season precipitation (mm) - May 01—Aug 31

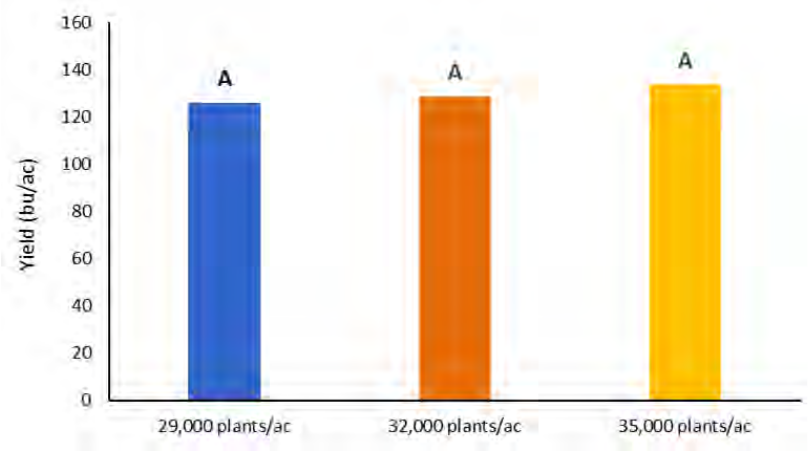
OVERALL YIELD

	Mean (bu/ac)
29,000 plants/ac	126.1^{A}
32,000 plants/ac	128.8^{A}
35,000 plants/ac	133.9^{A}
P-Value	0.4931
CV	6.88%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant difference in yield or plant stands at V2 between the 29,000, 32,000 and 35,000 seeds/acre planting rates. Rainfall was below average throughout the growing season. Plant stands were low due to uneven rainfall and germination in dry soils after planting.

MCA would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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Corn Planting Rate

Trial ID: 2021-CRNP06 — R.M. of Stanley

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in corn.

TRIAL INFORMATION	
Location	Winkler
Previous Crop	Potato
Soil Texture	Coarse Loams
Tillage	Conventional Tillage
Planting Date	May 04, 2021
Fertilizer (N-P-K-S)	91N 28P 63K
Variety	DKC31-85RIB
Row Spacing	30”
Planting Rate (seeds/ac)	30.8K, 33.8K, 36.8K & VR
Harvest Date	October 25, 2021

SOIL PROPERTIES†

N 0-24”	P (ppm)	K (ppm)	% O.M.
92	32	252	2.4

†Nutrient values prior to spring seeding

PLANT STAND @ V2

Planting Rate (seeds/ac)	30,800	33,800	36,800	VR
Plants/acre	28,250	32,750	33,750	34,000

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	40	43	24	97	**205**
Normal	59	77	67	77	**280**

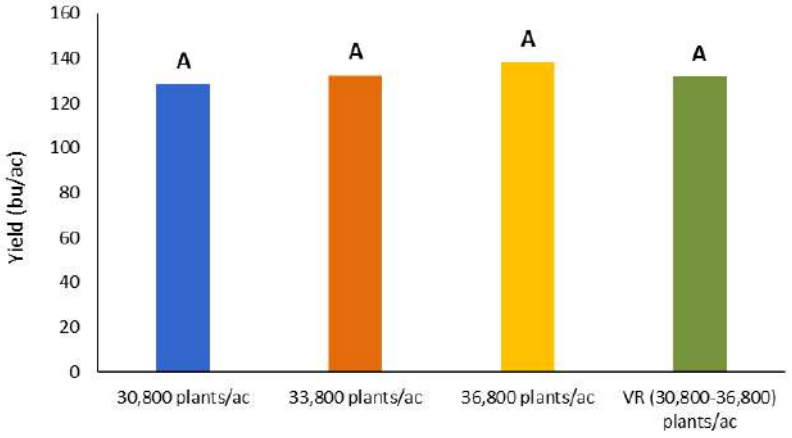
†Growing season precipitation (mm) - May 01—Aug 31

OVERALL YIELD

	Mean (bu/ac)
30,800 plants/ac	128.4^{A}
33,800 plants/ac	132.4^{A}
36,800 plants/ac	138.4^{A}
VR (30,800-36,800) plants/ac	131.8^{A}
P-Value	0.5318
CV	7.07%
Significance	**No**

FIELD IMAGE

YIELD BY TREATMENT



Summary: There was no significant difference in yield or plant stands at V2 between the 30,800, 33,800, 36,800 and variable rate average (30.8K-36.8K) seeds/acre planting rates. Rainfall was well below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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Corn Planting Rate

Trial ID: 2021-CRNP07 — R.M. of Rhineland

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in corn.

TRIAL INFORMATION	
Location	Plum Coulee
Previous Crop	Potato
Soil Texture	Coarse Loams
Tillage	Conventional Tillage
Planting Date	May 04, 2021
Fertilizer (N-P-K-S)	120N
Variety	9202-G
Row Spacing	10”
Planting Rate (seeds/ac)	35K, 38K & 41K
Harvest Date	October 26, 2021

SOIL PROPERTIES†			
N 0-24”	**P (ppm)**	**K (ppm)**	**% O.M.**
338	103	358	3.3

†Nutrient values prior to spring seeding

PLANT STAND @ V2			
Planting Rate (seeds/ac)	35,000	38,000	41,000
Plants/acre	35,000	35,500	34,250

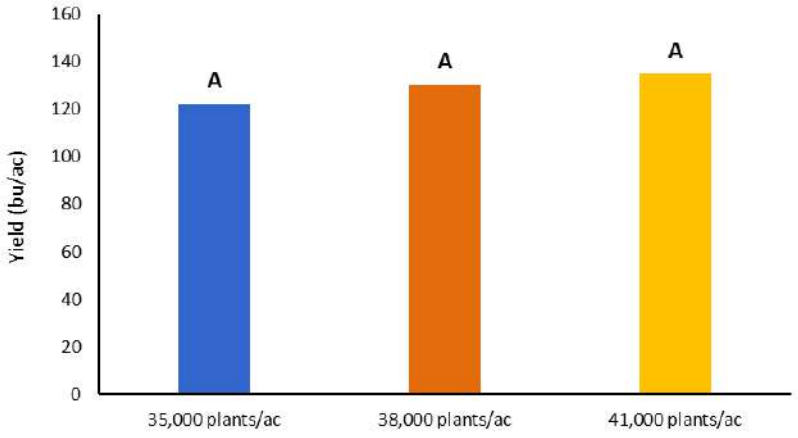
PRECIPITATION†					
	May	**June**	**July**	**Aug**	**Total**
Rainfall	40	43	24	97	**205**
Normal	59	77	67	77	**280**

†Growing season precipitation (mm) - May 01—Aug 31

OVERALL YIELD	
	Mean (bu/ac)
35,000 plants/ac	122.3^{A}
38,000 plants/ac	130.3^{A}
41,000 plants/ac	135.0^{A}
P-Value	0.1976
CV	5.45%
Significance	**No**

FIELD IMAGE

YIELD BY TREATMENT



Summary: There was no significant difference in yield or plant stands at V2 between the 35,000, 38,000 and 41,000 seeds/acre planting rates. Rainfall was well below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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Corn Planting Rate

Trial ID: 2021-CRNP08 — R.M. of North Norfolk

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in corn.

TRIAL INFORMATION	
Location	Bagot
Previous Crop	Wheat
Soil Texture	Fine Loams
Tillage	Conventional Tillage
Planting Date	May 05, 2021
Fertilizer (N-P-K-S)	166N 36P 86K 20S
Variety	P7527AM
Row Spacing	30”
Planting Rate (seeds/ac)	29K, 32K & 35K
Harvest Date	October 12, 2021

SOIL PROPERTIES†			
N 0-24”	**P (ppm)**	**K (ppm)**	**% O.M.**
103	17	277	2.8

†Nutrient values prior to spring seeding

PLANT STAND @ V2			
Planting Rate (seeds/ac)	29,000	32,000	35,000
Plants/acre	27,750	31,750	35,750

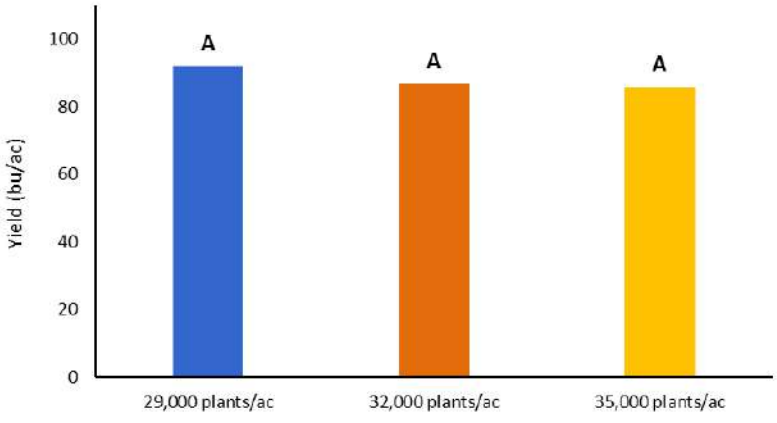
PRECIPITATION†					
	May	**June**	**July**	**Aug**	**Total**
Rainfall	52	69	5	97	**222**
Normal	50	76	64	78	**268**

†Growing season precipitation (mm) - May 01—Aug 31

OVERALL YIELD	
	Mean (bu/ac)
29,000 plants/ac	91.9[A]
32,000 plants/ac	86.7[A]
35,000 plants/ac	85.7[A]
P-Value	0.1735
CV	4.88%
Significance	**No**

FIELD IMAGE

YIELD BY TREATMENT



Summary: There was no significant difference in yield between the 29,000, 32,000 and 35,000 seeds/acre planting rates. There was a significant difference in plant stands between the three planting rates taken at V2. Rainfall was below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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Corn Planting Rate

Trial ID: 2021-CRNP09A — R.M. of Springfield

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in corn.

TRIAL INFORMATION	
Location	Hazelridge
Previous Crop	Soybeans
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	May 05, 2021
Fertilizer (N-P-K-S)	120N 50P 60K 23S
Variety	NS 178
Row Spacing	15”
Planting Rate (seeds/ac)	32K, 35K & 38K
Harvest Date	October 19, 2021

SOIL PROPERTIES†

N 0-24”	P (ppm)	K (ppm)	% O.M.
146	37	400	7.4

†Nutrient values prior to spring seeding

PLANT STAND @ V2

Planting Rate (seeds/ac)	32,000	35,000	38,000
Plants/acre	32,500	33,000	38,000

PRECIPITATION†

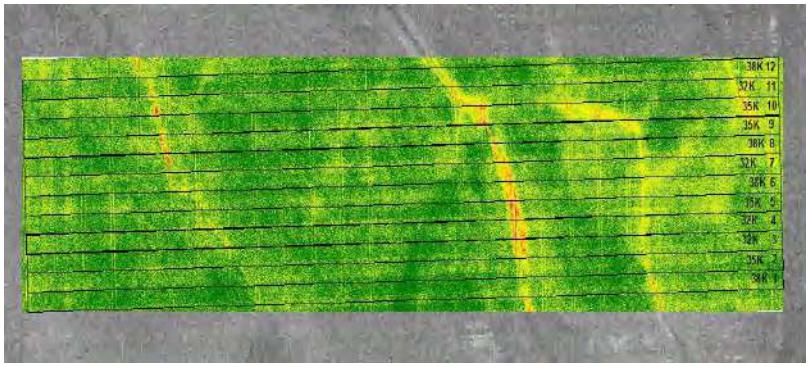
	May	June	July	Aug	Total
Rainfall	55	45	20	93	**179**
Normal	52	84	81	77	**294**

†Growing season precipitation (mm) - May 01—Aug 31

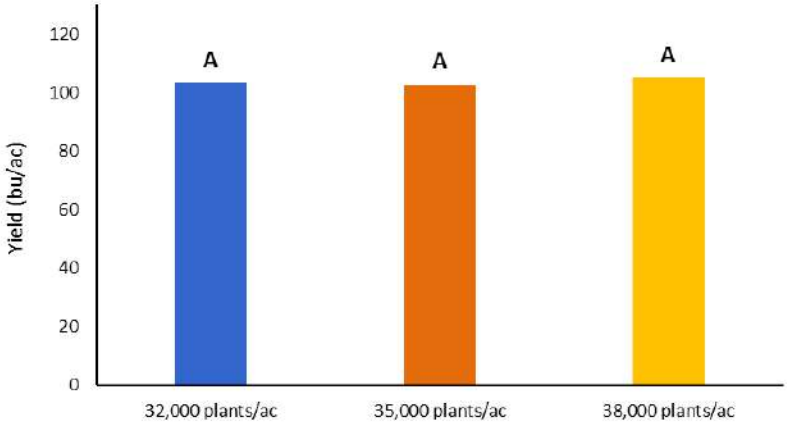
OVERALL YIELD

	Mean (bu/ac)
32,000 plants/ac	103.1^{A}
35,000 plants/ac	102.7^{A}
38,000 plants/ac	105.0^{A}
P-Value	0.9282
CV	8.50%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant difference in yield or plant stands at V2 between the 32,000, 35,000 and 38,000 seeds/acre planting rates. Rainfall was well below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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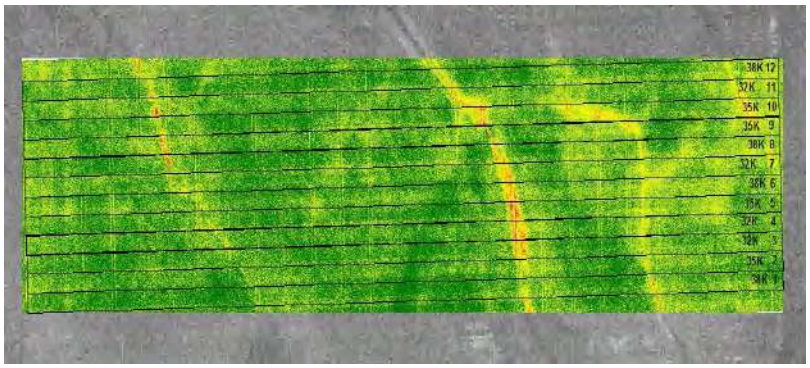
Corn Planting Rate

Trial ID: 2021-CRNP09B — R.M. of Springfield

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in corn.

TRIAL INFORMATION	
Location	Hazelridge
Previous Crop	Soybeans
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	May 05, 2021
Fertilizer (N-P-K-S)	120N 50P 60K 23S
Variety	NS 72-521 VT2PRIB
Row Spacing	15”
Planting Rate (seeds/ac)	32K, 35K & 38K
Harvest Date	October 19, 2021

FIELD IMAGE



SOIL PROPERTIES†

N 0-24”	P (ppm)	K (ppm)	% O.M.
146	37	400	7.4

†Nutrient values prior to spring seeding

PLANT STAND @ V2

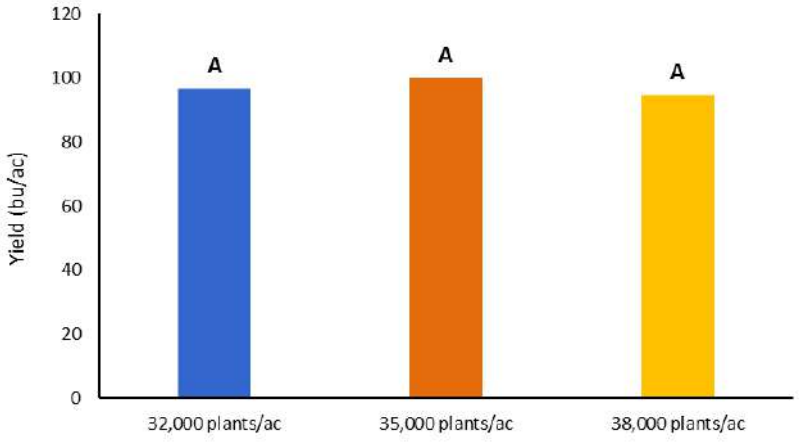
Planting Rate (seeds/ac)	32,000	35,000	38,000
Plants/acre	32,500	33,000	38,000

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	55	45	20	93	**179**
Normal	52	84	81	77	**294**

†Growing season precipitation (mm) - May 01—Aug 31

YIELD BY TREATMENT



OVERALL YIELD

	Mean (bu/ac)
32,000 plants/ac	96.5[A]
35,000 plants/ac	99.9[A]
38,000 plants/ac	94.6[A]
P-Value	0.2439
CV	4.12%
Significance	**No**

Summary: There was no significant difference in yield or plant stands at V2 between the 32,000, 35,000 and 38,000 seeds/acre planting rates. Rainfall was well below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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Corn Planting Rate

Trial ID: 2021-CRNP10 — R.M. of Brokenhead

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in corn.

TRIAL INFORMATION	
Location	Tyndall
Previous Crop	Soybeans
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	May 07, 2021
Fertilizer (N-P-K-S)	144N 12P
Variety	DKC26-40RIB
Row Spacing	22”
Planting Rate (seeds/ac)	31K, 34K & 37K
Harvest Date	October 12, 2021

SOIL PROPERTIES†			
N 0-24”	**P (ppm)**	**K (ppm)**	**% O.M.**
145	19	411	6.8

†Nutrient values prior to spring seeding

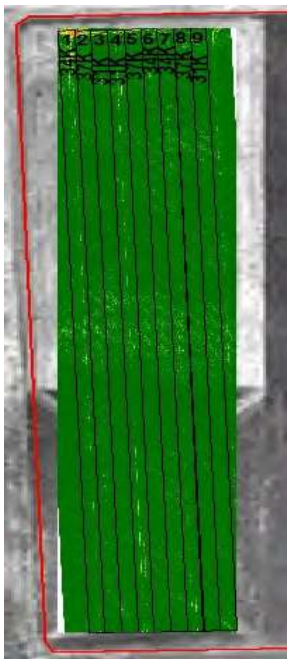
PLANT STAND @ V2			
Planting Rate (seeds/ac)	31,000	34,000	37,000
Plants/acre	30,667	33,667	35,667

PRECIPITATION†					
	May	**June**	**July**	**Aug**	**Total**
Rainfall	52	26	24	91	**192**
Normal	51	85	71	76	**283**

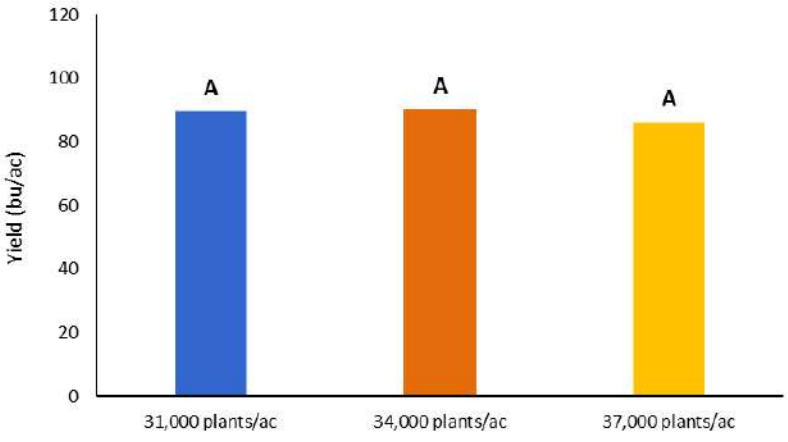
†Growing season precipitation (mm) - May 01—Aug 31

OVERALL YIELD	
	Mean (bu/ac)
31,000 plants/ac	89.7^{A}
34,000 plants/ac	90.2^{A}
37,000 plants/ac	86.1^{A}
P-Value	0.6886
CV	6.80%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant difference in yield or plant stands at V2 between the 31,000, 34,000 and 38,000 seeds/acre planting rates. Rainfall was well below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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Corn Planting Rate

Trial ID: 2021-CRNP11 — R.M. of Ritchot

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in corn.

TRIAL INFORMATION	
Location	Niverville
Previous Crop	Canola
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	May 08, 2021
Fertilizer (N-P-K-S)	180N
Variety	P7527AM
Row Spacing	22”
Planting Rate (seeds/ac)	32K, 34K & 37K
Harvest Date	October 22, 2021

SOIL PROPERTIES†			
N 0-24”	**P (ppm)**	**K (ppm)**	**% O.M.**
218	30	531	6.2

†Nutrient values prior to spring seeding

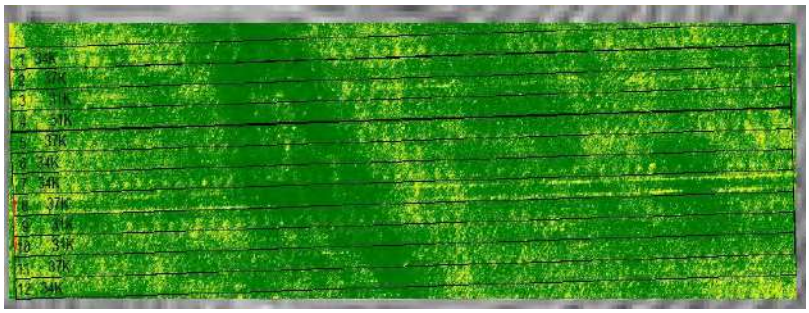
PLANT STAND @ V2			
Planting Rate (seeds/ac)	31,821	34,269	37,126
Plants/acre	29,250	33,000	35,250

PRECIPITATION†					
	May	**June**	**July**	**Aug**	**Total**
Rainfall	18	60	9	95	**182**
Normal	56	83	64	86	**289**

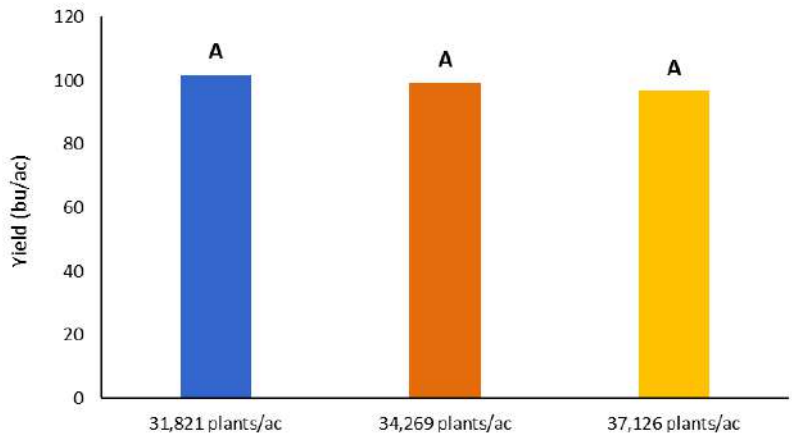
†Growing season precipitation (mm) - May 01—Aug 31

OVERALL YIELD	
	Mean (bu/ac)
31,821 plants/ac	101.8[A]
34,269 plants/ac	99.3[A]
37,126 plants/ac	96.7[A]
P-Value	0.7450
CV	9.15%
Significance	**No**

FIELD IMAGE



YIELD BY TREATMENT



Summary: There was no significant difference in yield or plant stands at V2 between the 31,821, 34,269 and 37,126 seeds/acre planting rates. Rainfall was well below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support for this trial.

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Sunflower Planting Rate Trial

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in sunflowers.

Summary: One site-year of oil-seed sunflowers (Table 1) and one site-year of confection sunflowers (Table 2) showed a significant yield difference between the three planting rates.

Table 1: Oil-seed Sunflower Single Site Analysis

Trial ID	Rural Municipality	Seed Rate (check)	Plant Stand @ V2			Yield			CV	P-Value	Statistically Significant @
			Low Seed Rate	Check Seed Rate	High Seed Rate	Low Seed Rate	Check Seed Rate	High Seed Rate			
		seeds/ac	seeds/ac			lbs/ac			%		95%
2021-SFLP01	De Salaberry	22,000	18,000^{A}	23,250^{B}	25,000^{C}	2,170	1,910	2,143	14.04	0.4333	No
2021-SFLP02	Brokenhead	23,000	21,250	23,250	23,500	3,293	3,305	3,305	1.75	0.9463	No
2021-SFLP03	Stuartburn	25,000	17,500^{A}	19,750^{B}	19,250^{AB}	2,516^{B}	2,870^{A}	2,812^{A}	4.53	0.0141	Yes
2021-SFLP04	Ritchot	25,000	24,500^{A}	26,000^{A}	29,500^{B}	2,058	1,981	1,995	5.29	0.5854	No
2021-SFLP05	Thompson	22,000	19,500	20,750	21,750	1,498	1,613	1,571	7.16	0.3958	No
2021-SFLP08	St. Andrews	23,000	22,250	24,500	25,500	1,191	1,220	1,222	6.57	0.8378	No

Table 2: Confection Sunflower Single Site Analysis

Trial ID	Rural Municipality	Seed Rate (check)	Plant Stand @ V2			Yield			CV	P-Value	Statistically Significant @
			Low Seed Rate	Check Seed Rate	High Seed Rate	Low Seed Rate	Check Seed Rate	High Seed Rate			
		seeds/ac	seeds/ac			lbs/ac			%		95%
2021-SFLP06	Emerson-Franklin	18,000	14,000^{A}	16,500^{AB}	18,000^{B}	3,156	2,912	3,039	7.09	0.6089	No
2021-SFLP07	North Norfolk	16,500	10,500^{A}	11,000^{AB}	15,500^{B}	2,768^{B}	2,796^{B}	3,058^{A}	4.66	0.0405	Yes

Table 3: Economic Analysis

Trial ID	Seed Rate (check)	Seed Cost/Acre			Yield			Net Profit/Acre (Seed Costs)			CV	P-Value	Statistically Significant @
		Low Seed Rate	Check Seed Rate	High Seed Rate	Low Seed Rate	Check Seed Rate	High Seed Rate	Low Seed Rate	Check Seed Rate	High Seed Rate			
		$/ac			lbs/ac			$/ac			%		95%
2021-SFLP03	25,000	$ 43.45	$ 49.37	$ 55.30	2,516	2,870	2,812	$1,063.59	$1,213.43	$1,181.98	4.53	0.0141	Yes

Indicates Statistical Difference at 95% confidence interval

Median Seed Cost of $395/bag

Sunflower Price (Nov 2021) - $0.44/lb

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Sunflower Planting Rate

Trial ID: 2021-SFLP01 — R.M. of De Salaberry

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in oil-seed sunflowers.

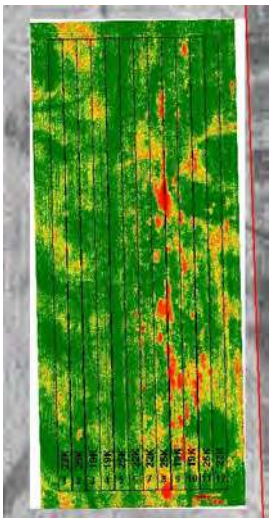
TRIAL INFORMATION	
Location	Otterburne
Previous Crop	Wheat
Soil Texture	Clay Loams
Tillage	Conventional Tillage
Planting Date	April 29, 2021
Fertilizer (N-P-K-S)	83N 45P 30K
Variety	P63ME80
Row Spacing	20”
Planting Rate (seeds/ac)	19K, 22K & 25K
Harvest Date	October 01, 2021

PLANT STAND @ V2			
Planting Rate (seeds/ac)	19,000	22,000	25,000
Plants/acre	18,000^{A}	23,250^{B}	25,000^{C}

SUNFLOWER QUALITY	19,000 plants/ac	22,000 plants/ac	25,000 plants/ac
% Dockage	- -	8.5	- -
% Moisture	- -	11.2	- -
TWT (lbs/bu)	- -	33	- -
Grade	- -	1	- -
Sizing 8 Slot	- -	77	- -

OVERALL YIELD	Mean (lbs/ac)
19,000 plants/ac	2,170^{A}
22,000 plants/ac	1,910^{A}
25,000 plants/ac	2,143^{A}
P-Value	0.4333
CV	14.04%
Significance	No

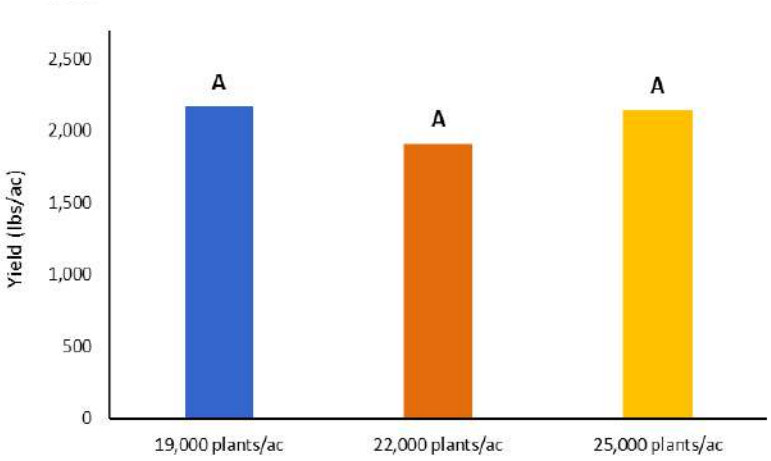
FIELD IMAGE



PRECIPITATION†	May	June	July	Aug	Total
Rainfall	35	61	12	108	**216**
Normal	52	86	63	66	**267**

†Growing season precipitation (mm) - May 01—Aug 31

YIELD BY TREATMENT



Summary: There was no significant difference in yield between the 19,000, 22,000 and 25,000 seeds/acre planting rates. There was a significant difference in plant stands between the three planting rates. Rainfall was below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and Scoular for the sunflower quality analysis for this trial.

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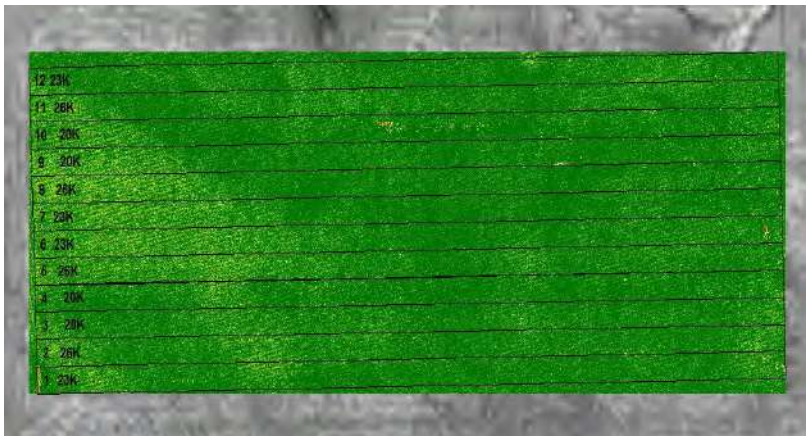
Sunflower Planting Rate

Trial ID: 2021-SFLP02 — R.M. of Brokenhead

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in oil-seed sunflowers.

TRIAL INFORMATION	
Location	Beausejour
Previous Crop	Soybeans
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	May 06, 2021
Fertilizer (N-P-K-S)	100N 30P
Variety	N4HM354
Row Spacing	20”
Planting Rate (seeds/ac)	20K, 23K & 26K
Harvest Date	October 12, 2021

FIELD IMAGE



PLANT STAND @ V2			
Planting Rate (seeds/ac)	20,000	23,000	26,000
Plants/acre	21,250[A]	23,250[A]	23,500[A]

SUNFLOWER QUALITY	20,000 plants/ac	23,000 plants/ac	26,000 plants/ac
% Dockage	2.0	2.5	2.8
% Moisture	11.1	11.1	11.2
TWT (lbs/bu)	34	34	35
Grade	1	1	1
Sizing 8 Slot	58	50	41

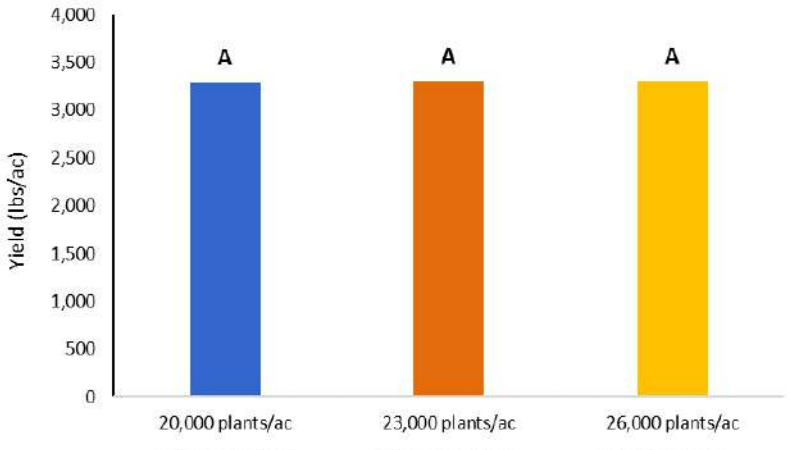
OVERALL YIELD	Mean (lbs/ac)
20,000 plants/ac	3,293[A]
23,000 plants/ac	3,305[A]
26,000 plants/ac	3,305[A]
P-Value	0.9463
CV	1.75%
Significance	No

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	52	26	24	89	**190**
Normal	51	85	71	73	**280**

†Growing season precipitation (mm) - May 01—Aug 31

YIELD BY TREATMENT



Summary: There was no significant difference in yield or plant stands at V2 between the 20,000, 23,000 and 26,000 seeds/acre planting rates. Rainfall was below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and Scoular for the sunflower quality analysis for this trial.

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Sunflower Planting Rate

Trial ID: 2021-SFLP03 — R.M. of Stuartburn

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in oil-seed sunflowers.

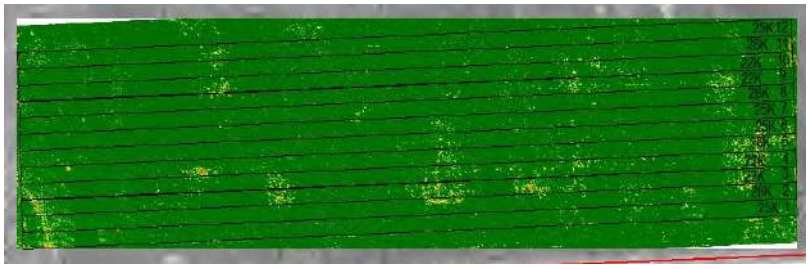
TRIAL INFORMATION	
Location	Pansy
Previous Crop	Soybeans
Soil Texture	Coarse Loam
Tillage	Minimal Tillage
Planting Date	May 01, 2021
Fertilizer (N-P-K-S)	70N 72K
Variety	P63ME80
Row Spacing	30”
Planting Rate (seeds/ac)	22K, 25K & 28K
Harvest Date	October 20, 2021

PLANT STAND @ V2			
Planting Rate (seeds/ac)	22,000	25,000	28,000
Plants/acre	17,500^{A}	19,750^{B}	19,250^{AB}

SUNFLOWER QUALITY	22,000 plants/ac	25,000 plants/ac	28,000 plants/ac
% Dockage	3.0	2.0	2.0
% Moisture	9.6	9.5	9.5
TWT (lbs/bu)	33	34	34
Grade	1	1	1
Sizing 8 Slot	91	91	87

OVERALL YIELD	Mean (lbs/ac)
22,000 plants/ac	2,516^{B}
25,000 plants/ac	2,870^{A}
28,000 plants/ac	2,812^{A}
P-Value	0.0141
CV	4.53%
Significance	**Yes**

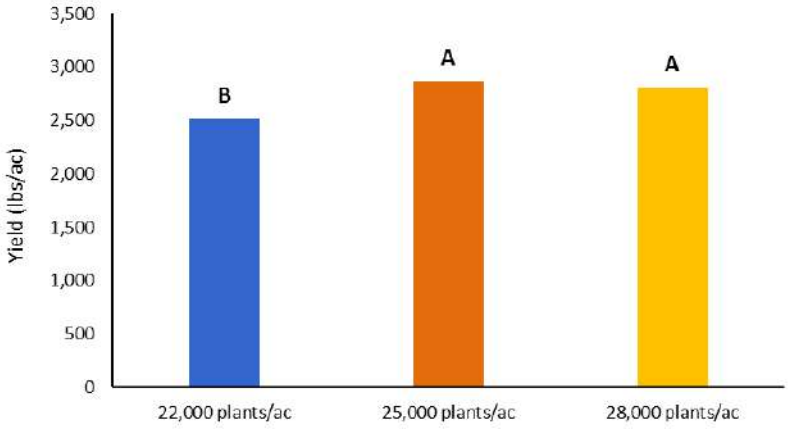
FIELD IMAGE



PRECIPITATION†	May	June	July	Aug	Total
Rainfall	74	60	47	69	**249**
Normal	62	93	92	81	**328**

†Growing season precipitation (mm) - May 01—Aug 31

YIELD BY TREATMENT



Summary: There was a significant difference in yield of 300+ lbs/acre between the 25,000 and 28,000 seeds/acre vs. the 22,000 seeds/acre planting rates. There was a significant difference in plant stands between the three planting rates. There was some seed that blew and was stranded at the soil surface, resulting in lower than anticipated plant stands. Rainfall was below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and Scoular for the sunflower quality analysis for this trial.

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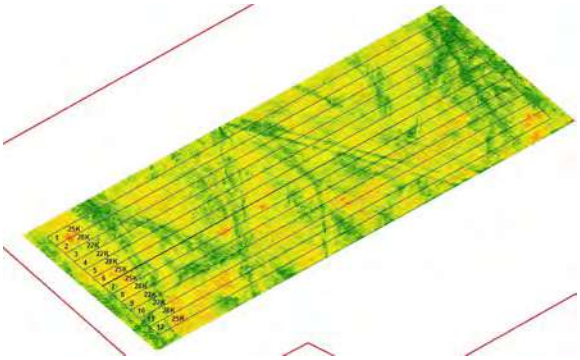
Sunflower Planting Rate

Trial ID: 2021-SFLP04 — R.M. of Ritchot

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in oil-seed sunflowers.

TRIAL INFORMATION	
Location	St. Adolphe
Previous Crop	Wheat
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	May 11, 2021
Fertilizer (N-P-K-S)	102N 39P
Variety	Talon
Row Spacing	20”
Planting Rate (seeds/ac)	22K, 25K & 28K
Harvest Date	September 24, 2021

FIELD IMAGE



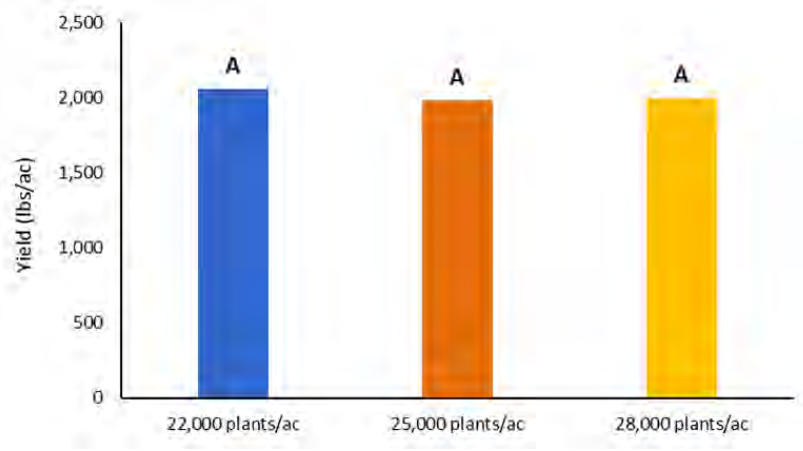
PLANT STAND @ V2			
Planting Rate (seeds/ac)	22,000	25,000	28,000
Plants/acre	24,500^{A}	26,000^{A}	29,500^{B}

PRECIPITATION†					
	May	**June**	**July**	**Aug**	**Total**
Rainfall	18	60	9	95	**182**
Normal	56	83	64	86	**289**

†Growing season precipitation (mm) - May 01—Aug 31

SUNFLOWER QUALITY	22,000 plants/ac	25,000 plants/ac	28,000 plants/ac
% Dockage	- -	7.5	- -
% Moisture	- -	10.1	- -
TWT (lbs/bu)	- -	34	- -
Grade	- -	1	- -
Sizing 8 Slot	- -	36	- -

YIELD BY TREATMENT



OVERALL YIELD	Mean (lbs/ac)
22,000 plants/ac	2,058^{A}
25,000 plants/ac	1,981^{A}
28,000 plants/ac	1,995^{A}
P-Value	0.5854
CV	5.29%
Significance	**No**

Summary: There was no significant difference in yield between the 22,000, 25,000 and 28,000 seeds/acre planting rates. There was a significant difference in plant stands between the 28,000 seeds/acre vs. the other two planting rates. Rainfall was well below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and Scoular for the sunflower quality analysis for this trial.

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Sunflower Planting Rate

Trial ID: 2021-SFLP05 — R.M. of Thompson

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in oil-seed sunflowers.

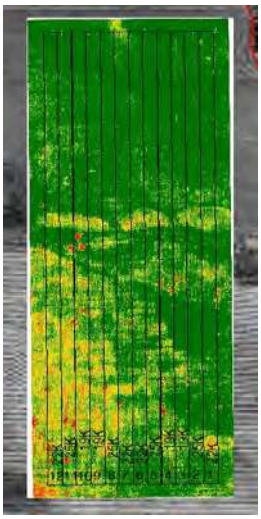
TRIAL INFORMATION	
Location	Miami
Previous Crop	Wheat
Soil Texture	Coarse Loam
Tillage	Conventional Tillage
Planting Date	May 12, 2021
Fertilizer (N-P-K-S)	100N
Variety	P63ME80
Row Spacing	30”
Planting Rate (seeds/ac)	19K, 22K & 25K
Harvest Date	October 18, 2021

PLANT STAND @ V2			
Planting Rate (seeds/ac)	19,000	22,000	25,000
Plants/acre	19,500[A]	20,750[A]	21,750[A]

SUNFLOWER QUALITY	19,000 plants/ac	22,000 plants/ac	25,000 plants/ac
% Dockage	8.0	7.0	7.0
% Moisture	12.2	9.3	10.3
TWT (lbs/bu)	33	34	34
Grade	1	1	1
Sizing 8 Slot	91	77	78

OVERALL YIELD	Mean (lbs/ac)
19,000 plants/ac	1,498[A]
22,000 plants/ac	1,613[A]
25,000 plants/ac	1,571[A]
P-Value	0.3958
CV	7.16%
Significance	**No**

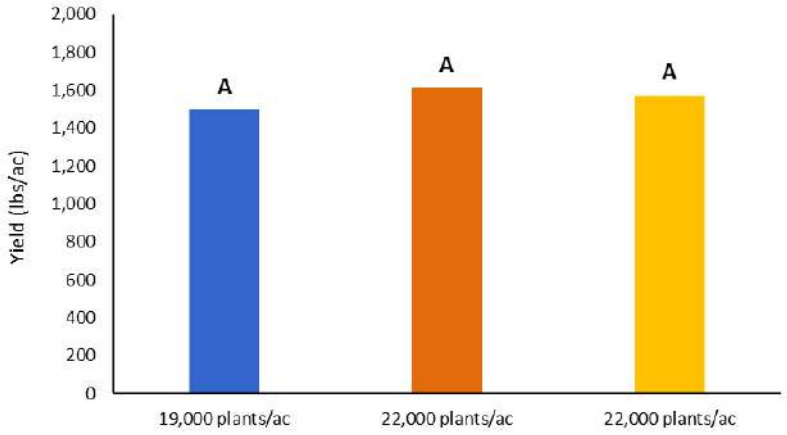
FIELD IMAGE



PRECIPITATION†	May	June	July	Aug	Total
Rainfall	26	112	16	91	**245**
Normal	56	86	69	74	**285**

†Growing season precipitation (mm) - May 01—Aug 31

YIELD BY TREATMENT



Summary: There was no significant difference in yield or plant stands at V2 between the 19,000, 22,000 and 25,000 seeds/acre planting rates. Rainfall was slightly below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and Scoular for the sunflower quality analysis for this trial.

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Sunflower Planting Rate

Trial ID: 2021-SFLP06 — R.M. of Emerson-Franklin

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in confection sunflowers.

TRIAL INFORMATION

Location	Ridgeville
Previous Crop	Wheat
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	May 13, 2021
Fertilizer (N-P-K-S)	128N 32P 5S 1%Zn
Variety	6946 DMR
Row Spacing	20”
Planting Rate (seeds/ac)	15K, 18K & 21K
Harvest Date	October 19, 2021

PLANT STAND @ V2

Planting Rate (seeds/ac)	15,000	18,000	21,000
Plants/acre	14,000^{A}	16,500^{AB}	18,000^{B}

PRECIPITATION†

	May	June	July	Aug	Total
Rainfall	21	26	43	70	**159**
Normal	56	82	81	76	**294**

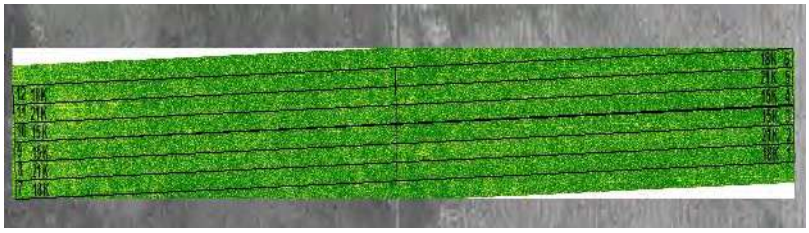
†Growing season precipitation (mm) - May 01—Aug 31

OVERALL YIELD

	Mean (lbs/ac)
15,000 plants/ac	3,156^{A}
18,000 plants/ac	2,912^{A}
21,000 plants/ac	3,039^{A}
P-Value	0.6089
CV	7.09%
Significance	**No**

Summary: There was no significant difference in yield between the 15,000, 18,000 and 21,000 seeds/acre planting rates. There was a significant difference in plant stands between the three planting rates. Rainfall was below average throughout the growing season.

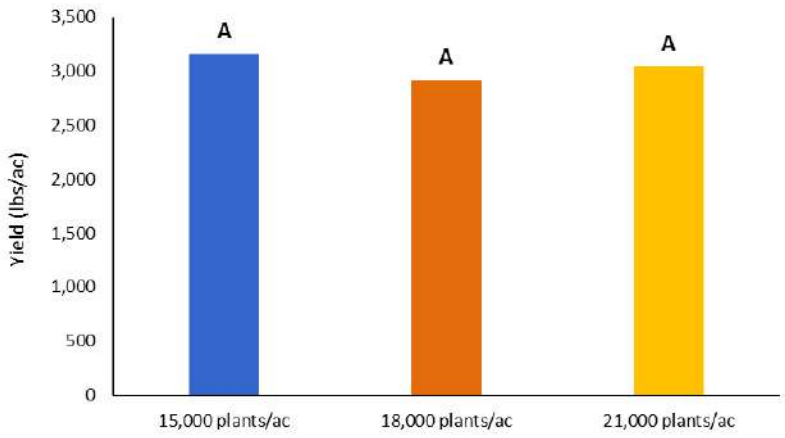
FIELD IMAGE



SUNFLOWER QUALITY

	15,000 plants/ac	18,000 plants/ac	21,000 plants/ac
% Dockage	5.0	13.0	9.0
% Moisture	14.6	13.6	11.5
TWT (lbs/bu)	25	25	26
Grade	1	1	1
Seed Sizing			
>24/64	21	13	7
>22/64	43	36	39
>20/64	24	35	38
<20/64	12	16	16

YIELD BY TREATMENT



MCA would like to thank Tone Ag Consulting Ltd. for the research support and Scoular for the sunflower quality analysis for this trial.

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Sunflower Planting Rate

Trial ID: 2021-SFLP07 — R.M. of North Norfolk

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in confection sunflowers.

TRIAL INFORMATION	
Location	Bagot
Previous Crop	Soybeans
Soil Texture	Fine Loams
Tillage	Strip Till
Planting Date	May 14, 2021
Fertilizer (N-P-K-S)	161N 50P 150K
Variety	6946 DMR
Row Spacing	22”
Planting Rate (seeds/ac)	13.5K, 16.5K & 19.5K
Harvest Date	October 12, 2021

PLANT STAND @ V2			
Planting Rate (seeds/ac)	13,500	16,500	19,500
Plants/acre	10,500^{A}	11,000^{AB}	15,500^{B}

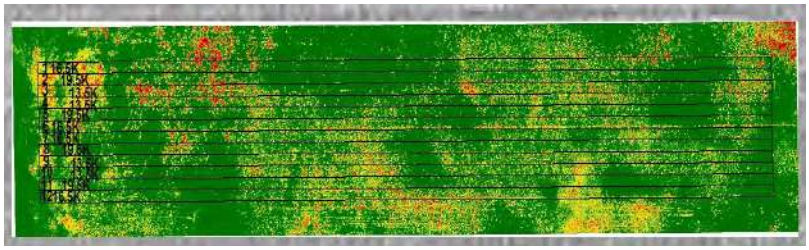
PRECIPITATION†					
	May	**June**	**July**	**Aug**	**Total**
Rainfall	52	69	5	97	**222**
Normal	50	76	64	78	**268**

†Growing season precipitation (mm) - May 01—Aug 31

OVERALL YIELD	
	Mean (lbs/ac)
13,500 plants/ac	2,768^{B}
16,500 plants/ac	2,796^{B}
19,500 plants/ac	3,058^{A}
P-Value	0.0405
CV	4.66%
Significance	**Yes**

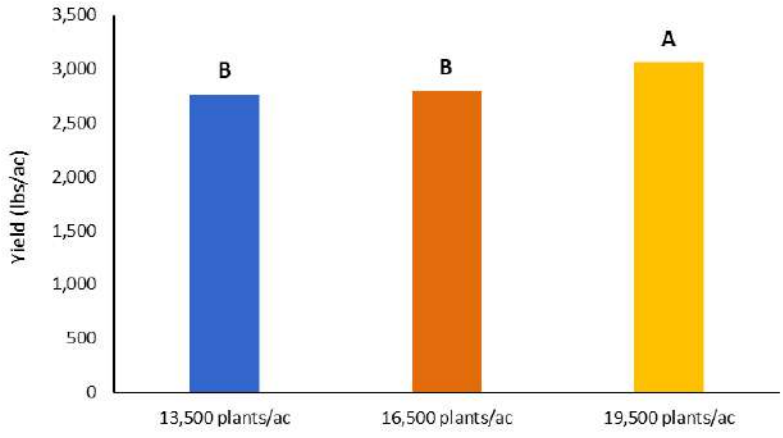
Summary: There was a significant difference in yield of 250+ lbs/acre between the 19,500 seeds/ acre vs. the 13,500 and 16,500 seeds/acre planting rates. There was a significant difference in plant stands between the three planting rates. Rainfall was below average throughout the growing season.

FIELD IMAGE



SUNFLOWER QUALITY			
	13,500 plants/ac	**16,500 plants/ac**	**19,500 plants/ac**
% Dockage	9.0	5.0	4.6
% Moisture	11.5	12.4	10.8
TWT (lbs/bu)	26	26	26
Grade	1	1	1
Seed Sizing			
>24/64	13	30	10
>22/64	40	41	37
>20/64	35	19	36
<20/64	12	10	17

YIELD BY TREATMENT



MCA would like to thank Tone Ag Consulting Ltd. for the research support and Scoular for the sunflower quality analysis for this trial.

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Sunflower Planting Rate

Trial ID: 2021-SFLP08 — R.M. of St. Andrews

Objective: The purpose of this project is to quantify the agronomic and economic impacts of reducing and increasing normal planting rate in oil-seed sunflowers.

TRIAL INFORMATION	
Location	St. Andrews
Previous Crop	Oats
Soil Texture	Clay
Tillage	Conventional Tillage
Planting Date	June 04, 2021 (re-seeded)
Fertilizer (N-P-K-S)	130N 50P 10S
Variety	N4HM354
Row Spacing	30”
Planting Rate (seeds/ac)	18K, 23K & 27K
Harvest Date	November 08, 2021

PLANT STAND @ V2			
Planting Rate (seeds/ac)	18,000	23,000	27,000
Plants/acre	22,250[A]	24,500[A]	25,500[A]

SUNFLOWER QUALITY	18,000 plants/ac	23,000 plants/ac	27,000 plants/ac
% Dockage	5.0	5.0	5.0
% Moisture	10.0	9.7	10.0
TWT (lbs/bu)	34	35	35
Grade	1	1	1
Sizing 8 Slot	44	41	36

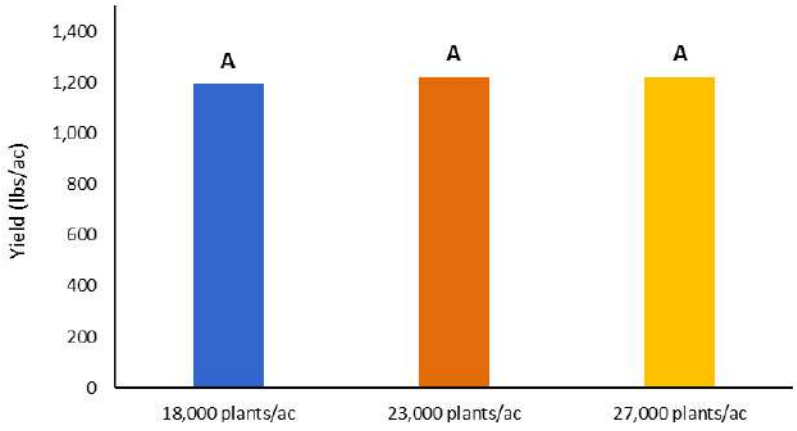
OVERALL YIELD	Mean (lbs/ac)
18,000 plants/ac	1,191[A]
23,000 plants/ac	1,220[A]
27,000 plants/ac	1,222[A]
P-Value	0.8378
CV	6.57%
Significance	No

FIELD IMAGE

PRECIPITATION†	May	June	July	Aug	Total
Rainfall	22	45	17	93	**177**
Normal	52	84	97	56	**289**

†Growing season precipitation (mm) - May 01—Aug 31

YIELD BY TREATMENT



Summary: There was no significant difference in yield and plant stands at V2 between the 18,000, 23,000 and 27,000 seeds/acre planting rates. Rainfall was below average throughout the growing season.

MCA would like to thank Tone Ag Consulting Ltd. for the research support and Scoular for the sunflower quality analysis for this trial.

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NOTES

WHAT IS THE MPSG ON-FARM NETWORK?

The MPSG On-Farm Network is a network of on-farm research related to pulse and soybean crops that is fully funded and directed by Manitoba Pulse & Soybean Growers. All research in this network is based on three important principles:

1 **PARTICIPATORY** Actively engages farmers in the research process.

2 **PRECISE** OFN trials produce robust and statistically sound data.

3 **PROACTIVE** Results from the OFN guide management decisions, aiming to improve productivity and profitability of the farm operation.

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