2024 Interim Report
for the
Saskatchewan Pulse Crop Development Board

Project Title: When should rapidly maturing soybean varieties be planted in Saskatchewan? (Project # AP2408a-SERF)

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1. **Project Code (as is in contract):** AP-2408a

2. **Project Title:** When should rapidly maturing soybean varieties be planted in Saskatchewan?

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5. **Abstract/Summary**

Small plot trials were conducted across Saskatchewan to evaluate the effect of seeding date on various early maturing cultivars of Soybean. These locations were located near Redvers, Swift Current, Scott, Indian Head, Yorkton, Melfort, Outlook and Prince Albert. The secondary objective was to evaluate the regional adaptation of soybeans with a range of maturity ratings in northern and southern locations in Saskatchewan. The trial was set up in Split plot design with two seeding times as the main plot factor and five soybean varieties belonging to different maturity groups (000.5, 000.7, 000.8, 000.9 and 00.2) as subplot factor. Data were collected for plant density, height, days to flowering, days to maturity, yield and protein. Unfortunately, the trial was cancelled at Swift Current which resulted in lack of data for all parameters except plant density.

The analyzed data revealed that there was significant effect on plant density at Outlook where late seeding date had a higher plant density than early seeding. A similar trend was seen at other locations

except southern locations (Redvers and Swift Current) where early seeding had a higher plant density than late seeding. Mixed results were seen for plant height. Data for days to flowering and days to maturity showed statistically significant difference with early and late seeding date, where soybean seeded early took significantly more number of days to flowering and ultimately maturity than late seeded soybean. Yield remained statistically non significant among seed date except Yorkton, where the late seeding date resulted in significantly higher yield than early seed date. Protein analysis results were mixed with some sites showing significant and some showing nonsignificant results among seed date and varieties.

6. Introduction

Soybeans are not yet widely adopted in Saskatchewan compared to other pulses, but recurring issues with pea root rot could increase interest in planting this crop across various growing regions of the province. Seeding date studies have shown moderate advantages to early planting (1). Tkachuk (2017) identified a yield decline of 16 kg/ha for each 1-day delay in seeding from 27 April to 22 June at Carman, MB, and Carrington, ND, concluding that calendar date was more influential to soybean yield than soil temperature (2). The yield advantage to earlier seeding, however, appears to be greater in the U.S. Midwest where the growing season is longer and warmer. In Wisconsin, for example, a 21.2 kg/ha yield reduction was observed for each day of delayed seeding from early May to mid-June (Gaspar & Conley, 2015). In an ADF project at ICDC (3), the optimal seeding date was reported to be May 21 - May 28 based on a wide range of dates from early May to mid-June. This project did not determine whether the optimal seeding date may vary with newer early maturing types that have been developed for the prairies since 2014 as opposed to later maturing varieties. (4). The ADOPT project at NARF found that while seeding soybean in mid May caused a significant delay in germination with lower plant populations, it resulted in higher yield than later May seeding. A study conducted in Manitoba (5) from 2015 to 2017 to evaluate the performance of three soybean cultivars at three seeding dates from 24 May to 24 June show that very late seeding reduced yield, seed weight, and oil but did not affect protein. A US study (6) found that planting date and cultivar maturity effects on seed protein concentration were not always consistent, but meal protein concentration generally decreased with lower temperatures during seed fill. More research is needed across Saskatchewan and in more years to improve seeding date recommendations.

1. Tkachuk, C. (2017). Evaluation of soybean (Glycine max) planting dates and plant densities in northern growing regions of the NorthernGreat Plains. M.Sc. thesis. Winnipeg, MB: University of Manitoba.
2. Gaspar, A. P., & Conley, S. P. (2015). Responses of canopy reflectance, light interception, and soybean seed yield to replanting suboptimal stands. Crop Science, 55, 377–385.
3. ADF20130055 AGRONOMIC INVESTIGATIONS OF IRRIGATED SOYBEAN. Irrigation Crop Diversification Corporation.
4. ADOPT20160479 Seeding Dates for Soybean in NE Saskatchewan, Northeast Agriculture Research Foundation.
5. MacMillan KP, Gulden RH. Effect of seeding date, environment and cultivar on soybean seed yield, yield components and seed quality in the Northern Great Plains. Agronomy Journal. 2020;112:1666–1678.
6. Salmerón M, Bourland FM, Buehring NW, Earnest L, Fritschi FB, Gbur EE, Golden BR, Hathcoat D, Lofton J, McClure AT, Miller TD, Neely C, Shannon G, Udeigwe TK, Verbree DA, Vories ED, Wiebold WJ and Purcell LC (2022) Regional analysis of planting date and cultivar maturity recommendations that improve soybean oil yield and meal protein concentration. Front. Plant Sci. 13:954111.

7. Objectives of the project

To evaluate the effect of seeding date on various early maturing cultivars of soybean.	In progress

To evaluate the regional adaptation of soybeans with a range of maturity ratings in northern and southern locations in Saskatchewan.	In progress
To compare soybean yield and plant establishment at early versus later seeding dates.	In progress
To compare the effect of variety and seeding date on protein content in soybean.	In progress

8. Materials and Methods

The trial was conducted at eight locations across Saskatchewan: SERF (Redvers), WCA (Swift Current), WARC (Scott), IHARF (Indian Head), ECRF (Yorkton), NARF (Melfort), ICDC (Outlook) and CLC (near Prince Albert). The treatments were arranged in a four-replicate split-plot design with seeding dates as the main plot and variety as the sub plot for the 2024.

Main Plot Factor: Seeding Date –

Early: May 12-19
Normal: May 20-30

Sub Plot Factor: Varieties of soybean of varying lengths of maturation:

Early Soy 1: Amirani R2 - 000.5 maturity
Early Soy 2: Wolf R2X - 000.7 maturity
Early Soy 3: NSC Watson - 000.8 maturity
Early Soy 4: S0009-F2X - 000.9 maturity
Normal Soy: PV 22s002 - 00.2 maturity

Earlier, above mentioned five varieties were proposed for the trial but later the varieties were changed to the following due to seed availability.

Early Soy 1: BY Nebo - 000.5 maturity
Early Soy 2: Wolf R2X - 000.7 maturity
Early Soy 3: NSC Dauphin - 000.8 maturity
Early Soy 4: S0009-x84 - 000.9 maturity
Normal Soy: PV 22s002 RR2X - 00.2 maturity

Plant counts were conducted by measuring four-meter rows per plot and later converting the data into plants per square meter. Likewise, plant height was recorded as the average measurement of two randomly selected plants per plot. Additionally, data on flowering initiation dates, days to maturity (defined as when 90% of pods had changed color), yield, and seed protein content were also collected.

9. Results

Plant density:

The plant density was determined by counting the number of plants in a one-meter row at four different locations within each plot. These values were then converted into plants per square meter to standardize the measurements across sites.

At Redvers and Swift Current, there was no statistically significant difference in plant density between the two seeding dates. However, the early seeding date consistently resulted in a relatively higher plant

density compared to the late seeding date. Plant density varied significantly among different varieties, indicating that variety selection played an influential role at these sites.

At Indian head, Yorkton, Melfort, Scott and Prince Albert, plant density differences remained statistically non-significant across both seeding dates and varieties, except for Yorkton. At this location, a statistically significant difference was observed among different varieties.

At Outlook, which was the only irrigated location, both seeding date and variety had a significant impact on plant density.

The detailed results of plant density assessments across different sites are presented in Tables 1 and 1A.

Table :1 Plant density (plants /m^2)

Seeding Date	Redvers	Indian Head	Prince Albert	Swift Current	Yorkton	Melfort	Scott	Outlook
	Plant density (plants/sqm)							
Early Seeding	45.4	60.9	50.7	27.4	58.2	43.7	34.7	28.1^{B}
Late Seeding	38.2	64.0	53.3	24.1	60.6	45.9	35.6	44.0^{A}
P- value	0.058	0.163	0.561	0.245	0.436	0.115	0.672	0.009

Table :1A Plant density (plants /m^2)

Variety	Redvers	Indian Head	Prince Albert	Swift Current	Yorkton	Melfort	Scott	Outlook
	Plant density (plants/sqm)							
Early Soy 1: (000.5)	36.3^{B}	60.6	52.4	26.1^{A}	62.3^{AB}	42.7	33.2	35.6^{B}
Early Soy 2: (000.7)	44.6^{AB}	65.0	50.6	24.5^{AB}	59.1^{AB}	45.0	35.8	47.6^{A}
Early Soy 3: (000.8)	47.8^{A}	64.9	53.0	29.6^{A}	58.7^{AB}	45.2	36.7	34.4^{B}
Early Soy 4: (000.9)	43.3^{AB}	61.0	56.1	29.1^{A}	65.0^{A}	47.6	38.9	32.4^{B}
Normal Soy: (00.2)	37.2^{B}	60.6	47.9	19.5^{B}	52.1^{B}	43.6	31.4	30.1^{B}
P- value	0.014	0.108	0.173	0.0003	0.041	0.608	0.269	0.0001

Plant height (cm):

Plant height was measured by selecting two random plants within each plot and calculating the average height. This measurement was recorded at all locations except for Swift Current and Redvers. At Swift Current, the trial was canceled due to insufficient moisture, which led to poor crop development, making accurate height assessments unfeasible.

At Indian Head, Yorkton and Scott, plant height differences between the two seeding dates were not statistically significant. However, there was a significant variation among different varieties, indicating that plant height was primarily influenced by genetic differences rather than seeding date. This suggests that the genetic makeup of each variety played a crucial role in determining plant height at these locations.

In contrast, at Prince Albert, Melfort and Outlook, plant height differences were found statistically significant among seeding dates. Here, the later seeding date resulted in a significantly greater plant height compared to the early seeding date. This suggests that environmental factors associated with the later seeding date at these sites.

A detailed presentation of plant height data across different sites can be found in Tables 2 and 2A.

Table :2 Plant Height (cm)

Seeding Date	Indian Head	Prince Albert	Yorkton	Melfort	Scott	Outlook
	Plant Height (cm)					
Early Seeding	52.7	54.7^{B}	45.0	70.1^{B}	38.0	57.8^{B}

Late Seeding	52.9	64.6 ^{A}	53.6	77.0 ^{A}	37.7	72.4 ^{A}
P- value	0.781	0.037	0.057	0.021	0.758	0.005

Table :2A Plant Height (cm)

Variety (Maturity)	**Indian Head**	**Prince Albert**	**Yorkton**	**Melfort**	**Scott**	**Outlook**
	Plant Height (cm)					
Early Soy 1: (000.5)	54.3^{A}	58.4^{B}	45.1 ^{B}	70.9 ^{B}	37.8^{AB}	64.6 ^{B}
Early Soy 2: (000.7)	48.5^{B}	57.1 ^{B}	44.0 ^{B}	68.6 ^{B}	34.2 ^{B}	63.5 ^{B}
Early Soy 3: (000.8)	55.9^{A}	56.4 ^{B}	54.5 ^{A}	78.1 ^{A}	41.1 ^{A}	53.5^{C}
Early Soy 4: (000.9)	50.5^{B}	53.9 ^{B}	44.8 ^{B}	69.3 ^{B}	38.4 ^{AB}	65.2 ^{B}
Normal Soy: (00.2)	54.8^{A}	72.4^{A}	58.1 ^{A}	80.9 ^{A}	37.5 ^{AB}	78.8 ^{A}
P- value	0.0	0.0	0.0	0.0	0.022	0.0

Days to flowering:

The number of days to flowering showed a statistically significant variation between different seeding dates. Specifically, soybean plants that were sown earlier took a significantly longer time to reach the flowering stage compared to those sown at a later date. This suggests that environmental conditions associated with early seeding, such as lower temperatures during the initial growth stages, may have contributed to delayed flowering.

Additionally, significant differences in days to flowering were observed among different soybean varieties at all locations where data was recorded. This indicates that genetic factors also played a crucial role in determining the time required for flowering. However, at Prince Albert, Outlook and Swift Current, data for this parameter was unavailable

A detailed breakdown of the days to flowering across different seeding dates and varieties is presented in Tables 3 and 3A.

Table :3 Days to flowering

Seeding Date	**Redvers**	**Indian Head**	**Yorkton**	**Melfort**	**Scott**
	Days to flowering				
Early Seeding	61.4^{A}	60.8 ^{A}	56.7 ^{A}	65.8 ^{A}	65.7 ^{A}
Late Seeding	53.0^{B}	50.6 ^{B}	49.6 ^{B}	54.6 ^{B}	53.8 ^{B}
P- value	0.0	0.0	0.0001	0.0	0.0003

Table :3A Days to flowering

Variety (Maturity)	**Redvers**	**Indian Head**	**Yorkton**	**Melfort**	**Scott**
	Days to flowering				
Early Soy 1: (000.5)	57.0^{BC}	56.5 ^{A}	54.1 ^{A}	61.4 ^{A}	59.8
Early Soy 2: (000.7)	57.3^{AB}	55.7 ^{B}	53.9 ^{A}	59.9 ^{B}	59.3
Early Soy 3: (000.8)	56.6^{C}	54.4^{C}	51.4 ^{C}	58.4 ^{C}	58.8
Early Soy 4: (000.9)	57.6^{A}	56.5 ^{A}	52.8 ^{B}	61.9 ^{A}	60.1
Normal Soy: (00.2)	57.4^{AB}	55.4 ^{B}	53.4 ^{AB}	59.4 ^{BC}	60.6
P- value	0.0003	0.0	0.0	0.0	0.621

The data for interaction is presented in the table below where early seeding resulted in significantly more number of days to flowering than late seeding date whereas data remained non-significant within the varieties for early seeding except at Indian head where Early Soy 3 took significantly less days than all other varieties.

Table 3B. Days to Flowering (Seed date x Varieties)

Seed date	Varieties	Redvers	Indian Head	Melfort
Early	**Early Soy 1: (000.5)**	61^{A}	61^{A}	67^{A}
Early	**Early Soy 2: (000.7)**	62^{A}	61^{A}	65^{A}
Early	**Early Soy 3: (000.8)**	61^{A}	60^{B}	66^{A}
Early	**Early Soy 4: (000.9)**	62^{A}	61^{A}	66^{A}
Early	**Normal Soy: (00.2)**	62^{A}	61^{A}	66^{A}
Late	**Early Soy 1: (000.5)**	53^{BC}	52^{C}	56^{BC}
Late	**Early Soy 2: (000.7)**	53^{C}	50^{D}	55^{CD}
Late	**Early Soy 3: (000.8)**	52^{C}	49^{F}	51^{E}
Late	**Early Soy 4: (000.9)**	54^{B}	52^{C}	58^{B}
Late	**Normal Soy: (00.2)**	53^{BC}	50^{E}	53DE
p-value		0.0108	0.0	0.0

Days to maturity:

The collected data on days to maturity, defined as the stage when 90% of the pods had changed color, showed a statistically significant variation based on seeding date. At all sites where data was available, soybean plants sown earlier required a significantly greater number of days to reach maturity compared to those sown later. This suggests that early-seeded soybeans experienced prolonged growth periods, potentially due to exposure to cooler temperatures during early developmental stages. However, at Outlook and Swift Current, data for days to maturity was unavailable

In addition to seeding date, variety type also had a statistically significant effect on the number of days required for maturity. Among all the tested varieties, the maturity group (0.002) took significantly longer to reach maturity compared to all other varieties.

A detailed presentation of the days to maturity across different seeding dates and varieties is provided in the following tables. There was no variation was found in replications at Prince albert so means were used to present the data.

Table :4 Days to maturity

Seeding Date	Redvers	Indian Head	Prince Albert	Yorkton	Melfort	Scott
	Days to Maturity					
Early Seeding	118.0^{A}	122.2^{A}	124.0	124.2^{A}	124.9^{A}	124.4^{A}
Late Seeding	111.5^{B}	110.4^{B}	109.0	113.9^{B}	114.1^{B}	114.8^{B}
P- value	0.002	0.0	----	0.0	0.0006	0.0005

Table :4A Days to maturity

Variety (Maturity)	Redvers	Indian Head	Prince Albert	Yorkton	Melfort	Scott
	Days to Maturity					
Early Soy 1: (000.5)	113.4^{B}	113.8^{D}	116.5	117.0^{C}	116.1^{D}	115.6^{CD}
Early Soy 2: (000.7)	115.0^{B}	115.9^{C}	116.5	118.4^{BC}	119.3^{C}	121.4^{B}
Early Soy 3: (000.8)	110.4^{C}	111.2^{E}	112.5	117.5^{C}	115.3^{D}	111.5^{D}
Early Soy 4: (000.9)	115.6^{B}	118.3^{B}	112.5	119.3^{B}	121.3^{B}	120.4^{BC}
Normal Soy: (00.2)	119.3^{A}	122.2^{A}	124.5	123.0^{A}	125.6^{A}	128.9^{A}
P- value	0.0	0.0	----	0.0	0.0	0.0

Statistically different results were seen at Indian Head within all seeding dates and maturity groups, and these data are presented in table below:

Table 4B. Days to Maturity (Seed date x Varieties)

Seed date	Varieties	Indian Head
Early	**Early Soy 1: (000.5)**	120^{D}
Early	**Early Soy 2: (000.7)**	122^{C}
Early	**Early Soy 3: (000.8)**	116^{E}
Early	**Early Soy 4: (000.9)**	125^{B}
Early	**Normal Soy: (00.2)**	128^{A}
Late	**Early Soy 1: (000.5)**	107^{H}
Late	**Early Soy 2: (000.7)**	110^{G}
Late	**Early Soy 3: (000.8)**	106^{I}
Late	**Early Soy 4: (000.9)**	112^{F}
Late	**Normal Soy: (00.2)**	116^{E}
p-value		0.0

Yield:

Yield data was collected by harvesting the soybean plots using a plot combine harvester, ensuring a uniform and precise collection process. After harvesting, the total weight of the soybean produce was measured, and its moisture content was recorded. The recorded yield was adjusted to a standardized moisture content of 13% before being converted into kilograms per hectare (kg/ha). Statistical analysis of the yield data revealed that, at most locations, there was no significant difference in yield between the different seeding dates. However, at Yorkton, a statistically significant difference was observed.

Among all sites, Outlook recorded the highest yield. This result is expected, as Outlook is the only irrigated location in the study. The availability of consistent and controlled moisture levels in irrigated conditions likely contributed to higher productivity compared to rainfed sites.

A detailed presentation of the yield data across different seeding dates and sites is provided in the following tables.

Table :5 Yield (kg/ha)

Seeding Date	Redvers	Indian Head	Prince Albert	Yorkton	Melfort	Scott	Outlook
	Yield (kg/ha)						
Early Seeding	3559.2	2427.3	2913.2	1488.8^{B}	1913.7	1137	5022.4
Late Seeding	3160.5	2453.7	3203.9	2179.1^{A}	2007.7	1135	5914.3
P- value	0.363	0.445	0.127	0.013	0.492	0.962	0.121

Table :5A Yield (kg/ha)

Variety (Maturity)	Redvers	Indian Head	Prince Albert	Yorkton	Melfort	Scott	Outlook
	Yield (kg/ha)						
Early Soy 1: (000.5)	3606.2^{A}	2584.8^{A}	3231.2	1800.5^{AB}	1975.9	1311.3^{A}	5532.9^{A}
Early Soy 2: (000.7)	3103.2^{B}	2370.9^{CD}	3122.6	1598.9^{B}	1933.2	1092.9^{AB}	5741.1^{A}
Early Soy 3: (000.8)	3202.4^{B}	2272.5^{D}	2775.2	2022.7^{A}	1999.3	1013.4^{B}	4700.9^{B}
Early Soy 4: (000.9)	3761.4^{A}	2551.9^{AB}	3206.2	1828.6^{AB}	2006.8	1133.7^{AB}	5778.8^{A}
Normal Soy: (00.2)	3125.7^{B}	2422.4^{BC}	2957.5	1919.2^{AB}	1888.5	1128.8^{AB}	5588.1^{A}
P- value	0.0	0.0	0.143	0.039	0.774	0.052	0.0

The interaction tables are presented below:

Table :5B Yield (kg/ha) (Seed date X Variety) Redvers

Time /Trt	Yield	Early,1	Early,2	Early,3	Early,4	Early,5	Late,1	Late,2	Late,3	Late,4
Early x Early Soy 1	3757.4									
Early x Early Soy 2	**3153.8**	**603.6***								
Early x Early Soy 3	3349.5	408	195.6							
Early x Early Soy 4	**3987.9**	230.5	**834.1***	**638.4***						
Early x Normal Soy	**3547.2**	210.2	393.4	197.8	**440.7***					
Late x Early Soy 1	3455	302.4	301.2	105.6	532.9	92.2				
Late x Early Soy 2	3052.7	704.8	101.2	296.8	935.2	494.5	402.3			
Late x Early Soy 3	3055.4	702	98.4	294	932.4	491.8	399.6	2.8		
Late x Early Soy 4	**3535**	222.4	381.2	185.5	452.9	12.2	80	**482.3***	**479.5***	
Late x Normal Soy	**2704.2**	1053.2	449.6	645.2	1283.7	843	**750.8***	348.4	351.2	**830.8***

p-value=0.0032

Table :5C Yield (kg/ha) (Seed date X Variety) Outlook

Time /Trt	Yield	Early,1	Early,2	Early,3	Early,4	Early,5	Late,1	Late,2	Late,3	Late,4
Early x Early Soy 1	4862.3									
Early x Early Soy 2	**5701.6**	**839.3***								
Early x Early Soy 3	**3655.3**	**1207.0***	**2046.4***							
Early x Early Soy 4	**5527.1**	664.8	174.5	**1871.9***						
Early x Normal Soy	**5365.8**	503.5	335.9	**1710.5***	161.4					
Late x Early Soy 1	6203.5	1341.2	501.9	2548.3	676.4	837.8				
Late x Early Soy 2	5780.5	918.2	78.9	2125.2	253.4	414.7	423			
Late x Early Soy 3	5746.5	884.2	44.9	2091.3	219.4	380.8	457	34		
Late x Early Soy 4	6030.5	1168.2	328.9	2375.3	503.4	664.8	173	250	284	
Late x Normal Soy	5810.5	948.2	108.8	2155.2	283.3	444.7	393.1	30	64	220.1

p-value=0.0

Seed Protein (%): The seed protein data, as presented in the following tables, reveals a mix of statistically significant and non-significant results across different sites. A detailed breakdown of the statistical significance of seed protein content across different sites, seeding dates, and varieties is provided in the following tables.

Table :6 Seed Protein (%)

Seeding Date	**Redvers**	**Indian Head**	**Prince Albert**	**Yorkton**	**Melfort**	**Scott**	**Outlook**
	Protein (%)						
Early Seeding	38.5	33.6	35.4 ^{B}	35.2	31.7	37.2	39.7
Late Seeding	39.5	33.3	37.2 ^{A}	35.9	31.9	37.2	40.2
P- value	0.450	0.202	0.010	0.083	0.460	0.889	0.238

Table :6A Seed Protein (%)

Variety (Maturity)	**Redvers**	**Indian Head**	**Prince Albert**	**Yorkton**	**Melfort**	**Scott**	**Outlook**
	Protein (%)						
Early Soy 1: (000.5)	37.1 ^{B}	32.0 ^{B}	35.4 ^{B}	33.8^{D}	30.2 ^{C}	39.1 ^{A}	38.6^{D}

Early Soy 2: (000.7)	39.8 A	34.1 A	37.0 A	37.4A	33.4 A	37.8 AB	41.2 A
Early Soy 3: (000.8)	39.8 A	33.4 A	36.5 AB	36.1B	33.1 A	37.7 AB	40.2 B
Early Soy 4: (000.9)	39.3 A	33.8 A	36.4 AB	35.2C	31.0 B	37.4 B	40.3 B
Normal Soy: (00.2)	39.1 A	33.9 A	36.4 AB	35.2C	31.5 B	34.1 C	39.6 C
P- value	0.0	0.0	0.019	0.0	0.0	0.0	0.0

There were some significant results seen at Prince Albert, Yorkton and Outlook for Interaction between seed date and varieties. Data is presented in the tables below:

Table :6B Seed Protein (%) (Seed date X Variety) Prince Albert

Time /Trt	Protein	**Early,1**	Early,2	Early,3	Early,4	**Early,5**	Late,1	Late,2	Late,3	Late,4
Early x Early Soy 1	34.653									
Early x Early Soy 2	**36.863**	**2.210***								
Early x Early Soy 3	35.393	0.74	1.47							
Early x Early Soy 4	35.405	0.752	1.457	0.013						
Early x Normal Soy	34.917	0.265	1.945	0.475	0.488					
Late x Early Soy 1	36.22	1.567	0.643	0.827	0.815	1.303				
Late x Early Soy 2	37.11	2.457	0.248	1.718	1.705	2.193	0.89			
Late x Early Soy 3	**37.64**	**2.987***	0.778	2.248	2.235	**2.723***	1.42	0.53		
Late x Early Soy 4	**37.337**	**2.685***	0.475	1.945	1.932	2.42	1.117	0.227	0.303	
Late x Normal Soy	**37.928**	**3.275***	1.065	2.535	2.523	**3.010***	1.708	0.818	0.288	0.59

p-value=0.042

Table :6C Seed Protein (%) (Seed date X Variety) Yorkton

Time /Trt	Protein	**Early,1**	**Early,2**	**Early,3**	**Early,4**	**Early,5**	**Late,1**	**Late,2**	**Late,3**	Late,4
Early x Early Soy 1	33.8									
Early x Early Soy 2	**36.813**	**3.013***								
Early x Early Soy 3	**35.562**	**1.762***	**1.250***							
Early x Early Soy 4	**35.025**	**1.225***	**1.788***	0.537						
Early x Normal Soy	**34.588**	0.788	**2.225***	0.975	0.438					
Late x Early Soy 1	**33.712**	0.088	**3.100***	1.85	1.313	0.875				
Late x Early Soy 2	**38.037**	**4.237***	1.225	**2.475***	**3.012***	**3.450***	**4.325***			
Late x Early Soy 3	**36.613**	**2.813***	0.2	1.05	1.587	2.025	**2.900***	**1.425***		
Late x Early Soy 4	**35.287**	1.487	1.525	0.275	0.262	0.7	**1.575***	**2.750***	**1.325***	
Late x Normal Soy	**35.8**	2	1.013	0.238	0.775	1.212	**2.088***	**2.237***	0.813	0.513

p-value=0.015

Table :6D Seed Protein (%) (Seed date X Variety) Outlook

Time /Trt	Protein	**Early,1**	**Early,2**	Early,3	Early,4	Early,5	**Late,1**	**Late,2**	**Late,3**	Late,4
Early x Early Soy 1	38.725									
Early x Early Soy 2	**41.275**	**2.550***								
Early x Early Soy 3	**39.525**	0.8	**1.750***							
Early x Early Soy 4	**39.9**	**1.175***	**1.375***	0.375						
Early x Normal Soy	**39.3**	0.575	**1.975***	0.225	0.6					
Late x Early Soy 1	**38.475**	0.25	**2.800***	1.05	1.425	0.825				
Late x Early Soy 2	**41.15**	**2.425***	0.125	1.625	1.25	1.85	**2.675***			
Late x Early Soy 3	**40.775**	2.05	0.5	1.25	0.875	1.475	**2.300***	0.375		

Late x Early Soy 4	**40.625**	1.9	0.65	1.1	0.725	1.325	**2.150***	0.525	0.15	
Late x Normal Soy	**39.9**	1.175	1.375	0.375	0	0.6	**1.425***	**1.250***	**0.875***	0.725

p-value=0.0006

Table: 7. P- values (Seed Date X Varieties)

Parameter	**Redvers**	**Indian Head**	**Prince Albert**	**Swift Current**	**Yorkton**	**Melfort**	**Scott**	**Outlook**
Plant density (plants/m^2)	0.2774	0.0526	0.7903	0.1454	**0.0158**	0.8118	0.6517	0.2152
Plant height (cm)	na	0.7493	0.5893	na	0.9542	0.5111	0.8956	0.8734
Days to flowering	**0.0108**	**0.0**	na	na	0.1214	**0.0**	0.5831	na
Days to Maturity	0.6634	**0.0**	na	na	0.4192	0.6816	0.152	na
Yield (kg/ha)	**0.0032**	0.0833	0.5977	na	0.1312	0.8442	0.3638	**0.0**
Protein (%)	0.424	0.2736	**0.0422**	na	**0.0158**	0.8836	0.2788	**0.0006**

10. Interim Conclusions

The collected data indicates that seeding dates have a clear impact on different maturity group's soybean varieties, particularly on key parameters such as days to flowering and days to maturity. The observed variations suggest that earlier or later planting times can significantly influence the crop's developmental timeline according to the location of the site, likely due to differences in temperature, daylight duration, and other environmental factors experienced during the growing season.

The early seeding date led to a relatively higher plant density compared to the late seeding date at the southern locations, specifically at (Redvers and Swift Current). However, at all other sites, the opposite trend was observed, with late seeding resulting in a higher plant density than early seeding. This variation in plant density suggests that environmental factors, such as temperature may have influenced seedling establishment differently across locations. The increased plant density at Redvers due to early seeding likely contributed to a higher soybean yield at this location compared to most other sites. The only exception was Scott, where yield levels were comparable. Unfortunately, yield data for Swift Current was unavailable, preventing a complete assessment of early seeding effects at this location.

Regarding protein content, a mixed interaction was observed, indicating that neither early nor late seeding had a consistent effect across all sites. This suggests that additional factors may have influenced protein levels in a more complex manner.

Once the project is fully completed and all data points are thoroughly analyzed, a more definitive conclusion can be drawn, allowing for more concrete recommendations regarding optimal seeding strategies for different maturity group varieties.

11. Technology transfer activities

This project was showcased during the growing season at the annual field days for all locations, Anmoldeep Matharu highlighted the project at ECRF field day at Yorkton on 23 July 2024. This project was presented at the CLC field day in Prince Albert to 67 producers on 23 July 2024. Chris Holzapfel presented results from Indian Head at the IHARF Soil and Crop Management Seminar on Feb. 5 in Melville in the presence of 100 people. This trial was also highlighted at Indian Head field day in the presence of Megan Reed from SPG with the attendance of 145 people.

12. Funding contributions & Acknowledgements

Financial support was provided by the Saskatchewan Pulse Growers, Sustainable Canadian Agricultural Partnership was recognized by all locations.

13. Appendix

Table: A Mean Temperature (°C)

Location	Year	May	June	July	August	September	Avg.
		----------Mean Temperature (°C) ----------					
Redvers	2024	10.9	14.7	20.0	17.7	15.8	15.8
	Long term	***11.1***	***16.2***	***18.7***	***18***	***12.5***	***15.3***
Indian Head	2024	10.6	13.6	19.5	17.9	15.9	15.5
	Long term	***10.8***	***15.8***	***18.2***	***17.4***	***11.5***	***14.7***
Prince Albert	2024	8.4	11.3	18.1	15.2	12.7	13.1
	Long term	***11.2***	***16.0***	***18.3***	***16.7***	***11.6***	***14.8***
Swift Current	2024	10.6	14.3	21.3	19.4	16.7	16.5
	Long term	***11.5***	***16.3***	***19.0***	***18.6***	***13.5***	***15.8***
Yorkton	2024	10.5	14.2	20.3	17.7		15.7
	Long term	***10.4***	***15.5***	***17.9***	***17.1***		***15.2***
Melfort	2024	10.1	13.2	19.4	17.4	15.6	15.1
	Long term	***10.1***	***15.2***	***17.8***	***16.7***	***11.7***	***14.3***
Scott	2024	9.8	13.3	18.9	17.4	14.7	14.8
	Long term	***10.8***	***15.3***	***17.1***	***16.5***	***10.4***	***14.0***
Outlook	2024	10.9	14.2	20.4	18.3	16.2	16.0
	Long term	***11.3***	***16.2***	***18.7***	***17.8***	**12.9**	***15.4***

Table: B Precipitation (mm)

Location	Year	May	June	July	August	September	Total
		---------- Precipitation (mm) ----------					
Redvers	2024	92	156.2	13.4	39	70.6	371.2
	Long term	***60***	***95.2***	***65.5***	***46.6***	***32.7***	***300***
Indian Head	2024	63.7	74.9	37.4	71.8	44.4	292.2
	Long term	***51.7***	***77.4***	***63.8***	***51.2***	***35.3***	***279.4***
Prince Albert	2024	69.6	118.8	31.4	42.0	27.4	289.2
	Long term	***36.5***	***66.8***	***61.3***	***43.6***	***30.7***	***238.9***
Swift Current	2024	73.6	52.1	18.6	18.2	47.8	210.3
	Long term	***43.4***	***60.5***	***56.4***	***40.4***	***37.3***	***238***
Yorkton	2024	56	120.4	22.9	42.3		241.6
	Long term	***51***	***80***	***78***	***62***		***271***
Melfort	2024	73	84	36.1	31.9	33.8	258.8
	Long term	***33.4***	***79.5***	***69.6***	***45.9***	***36***	***264.4***
Scott	2024	74.2	112.0	26.7	42.8	39.5	295.2
	Long term	***36.3***	***61.8***	***72.1***	***45.7***	***36.0***	***251.9***
Outlook	2024	62.6	122	19.1	3.8	52.7	260.2
	Long term	***41.1***	***62.7***	***54.7***	***43.2***	**30.8**	***232.5***

Table. C Agronomic information:

Operations	Redvers	Indian Head	Prince Albert	Swift Current	Yorkton	Melfort	Scott	Outlook
Seed date 1	13 May	11 May	May 15	13 May	15 May	10 May	14 May	10 May
Seed date 2	23 May	27 May	May 30	28 May	27 May	27 May	26 May	24 May
Previous crop	Canola	Wheat	Barley	---	---	Wheat	Wheat	Peas
Weed control	Glyphosate @0.67 lt/ac on 19 May	Glyphosate @0.67 lt/ac on 12 May and 2 June	Roundup Transorb HC @ 0.67/ac on May 28	Glyphosate @0.5 lt per ac on May 12	Transorb 0.66 l/ac On 12 May	Glyphosate @ 1 lt /ac on 12 May	Glyphosate 540 @ 1L/ac & AIM @ 35 ml/ac	N/A
In-crop (Agrochemical)	Viper 0.4 lt + UAN 28-0-0 @0.8 lt /ac on 20 June	@0.67 lt/ac on 20 June, 11 July for early seeding and 26 June and 18 July for late seeding	Assure 2 herbicide @ 0.5 L/ac on 26 June Priaxor @ 0.45 L/ha on 30 July	Assurell @ 220 ml/ac on 18 June	Weather man 0.666 on 20 June	Viper ADV @ 400 ml/ac on June 20, ,Centurion @ 150 ml/ac on Jun 21; Glyphosate 540 @ 670 ml/ac on July 4 Cygon @ 700 L/ha on Aug 10, 2024	Solo Ultra Q: Solo ADV II @ 325mL/ac & Caziva Ultra Q @ 154mL/ac Cotegra @ 280mL/ac	Round up 540 on 4th July 2024
Harvesting date	8 Sep	1 Oct	9 Oct	N/A	4 Oct	8 Oct	27 Sep and 8 Oct	15 Oct