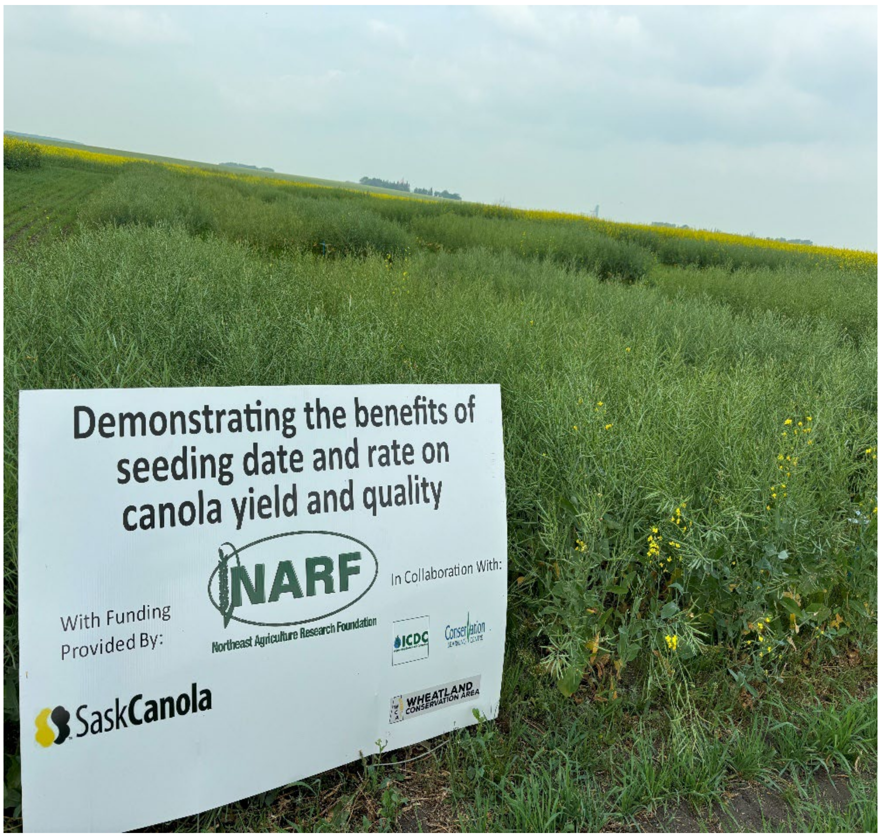
2024 Report

for the Saskatchewan Oilseed Development Commission

Project Title: Does seeding date and rate of canola effect spring flea beetle pressure, yield, and quality?

Project Number: CARP ADOPT 2023.560



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Project Identification

1. **Project Title:** Does seeding date and rate of canola effect spring flea beetle pressure, yield, and quality?
2. **Project Code (as is in contract):** CARP ADOPT 2023.560
3. **Producer Group Sponsoring the Project:** Saskatchewan Oilseed Development Commission
4. **Project Locations:** Melfort (RM #428), Scott (RM #380), Outlook (RM#284), and Swift Current (RM #137), SK
5. **Project start and end dates:** March 2024-April 5, 2025
6. **Project Contact Person & Contact Details:**

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<u>Objectives and Rationale:</u>

Project Objectives: To demonstrate canola yield and quality response to a wide variety of seeding dates in various locations in SK. To demonstrate what seeding date is the best for avoiding high flea beetle pressure in canola. To demonstrate if a higher canola seeding rate is a good management strategy to protect yield in the event of heavy flea beetle pressure.

Project Rationale:

Previous research completed in Western Canada has found that seeding canola early and at increased seeding rates can have a positive effect on yield and quality (Vera et al. 2007; Gusta et al. 2004; Harker et al. 2015). Vera et al. investigated seeding dates of early to mid-May as compared to late May and into the early days of June from 1998 to 2001 at Melfort, SK. In this study they found that seeding early resulted in greater canola grain yield, heavier seed weights, and greater oil content. Gusta et al investigated the quality of canola seed harvested from late fall, early spring (mid-april) and late spring (May 18-20) plantings at Scott, SK from 1997-1999. In this study they found that early spring planting demonstrated greater seed quality and greater seed yields as compared to late spring plantings of canola. Furthermore, with the recent very hot summer conditions, seeding canola early can help avoid crop flowering during very hot summer temperatures and allow the crop to mature before any early fall frosts.

While seeding early can be advantageous for producers in a short growing season, canola seed needs warm soil to germinate. The ideal temperature for rapid and even emergence is 10°C; however, canola can germinate in temperatures as low as 1-2°C (Canola Council of Canada). Although canola may germinate in low soil temperatures, it is important to be aware that emergence may be much slower and uneven as compared to canola being seeded into a warmer soil bed. Slow and uneven emergence of canola may leave the crop more susceptible to pest competition from weeds and common problem insects, such as flea beetles.

When considering an early seeding date another agronomic consideration may be a higher seeding rate to over-compensate for the potentially reduced emergence and/or increased potential for pest pressure. Higher seeding rates have the potential to increase plant density, crop biomass, seed weights, seed oil content, and reduced days to flower and crop maturity (Harker et al. 2015). Furthermore, an increased seeding rate may be advantageous to maintain an adequate stand when insect pressure is high.

The last several growing seasons have been much drier and warmer than the long-term average throughout most growing regions in Saskatchewan. For instance, in 2023 snow melt was delayed in some regions, however, the melt was rapid and most producers were able to commence field activities by early May in northern regions, and even earlier in southern regions. Some producers in the Northeast region of the province were seeding canola the 1st week of May, which is not usually the case. With no late spring frost and very warm and dry spring and summer conditions this ended up being a relatively smart agronomic decision for some. Depending on the region of the province, some areas may see canola being seeded as early as late April when dry spring conditions exist. With limited moisture throughout the growing season in recent years, taking advantage of early season soil moisture is essential for successful crop establishment.

According to a recent article in the Western Producer, some farmers are continuing to seed canola in late May even though there are known benefits of seeding early. According to Tyler Wist, an entomologist with Agriculture and Agri-Foods Canda, seeding canola early used to work well to get canola out of the ground before flea beetle populations appeared. Past research recommending early canola seed dates was when crucifer flea beetles were more prevalent; however, striped flea beetles have become more common. According to Tyler Wist, striped flea beetles emerge two weeks earlier in the spring than crucifer, which can now make seeding early less advantageous (The Western Producer 2023). Seeding date for canola should ideally be based on soil moisture conditions and soil temperature rather than a specific date; however, producers are wanting to get the crop in the ground whenever they can manage to do so.

Knowing that seeding early is best for canola yield and quality, while also considering that seeding early may increase flea beetle pressure on the crop poses conflicting best management practices for canola producers. With tight canola rotations in major growing regions of the province resulting in high flea beetle populations, along with growing concerns of foliar insecticide use, relying on good agronomic decision making is essential. The intended benefit of this demonstration for producers is to show case a wide range of seeding dates in canola, in combination with an adequate and increased seeding rate, so producers can make best management decisions for seeding canola to avoid heavy flea beetle infestations and the need for insecticides, while achieving high yields and best quality.

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Methodology and Results:

Methodology:

The demonstration was conducted in 2024 at four Agri-ARM sites in Saskatchewan- Melfort (NARF) in northeast SK, Swift Current (WCA) in southwest SK, Scott (WARC) in northwest SK, and Outlook (ISask) in central SK. NARF, WCA, and WARC were all dryland sites, while ISask was under irrigation. NARF was in the thick black soil zone, WCA was in the brown soil zone, and WARC and Outlook were in the dark brown soil zone. These locations were selected to allow us to demonstrate responses across a wide range of environmental conditions.

The demonstration was set up as a split-plot arrangement with seeding date as the main plot and seed rate as the sub-plot. Seeding dates were seeded in strips and not randomized. Five seeding dates were used including Ultra Early (last week of April to 1st week of May), Early (1st two weeks of May), Typical (mid to late May), Late (very end of May to 1st week of June) and Very Late (Early to mid June). Seeding date targets varied by site based on spring snowmelt and individual site conditions. Ultra early was intended to be seeded as early as possible following spring snow melt, and each additional seed date was to target 10 days following the previous seed date. Exact dates varied by site and are provided in Table 2 of the Appendices. Seeding rate was also dependent on site. At NARF, WCA, and WARC the 1X seeding rate was 40 seeds/m², while accounting for 50% seedling mortality. At ISask, the 1X seeding rate was 100 seeds/m², while accounting for 50% seedling mortality. This difference in site seeding rate was due to seeding rate targets being higher for producers under irrigation versus dryland sites. At each site the 2X seeding rate was doubled relative to the 1X rate. Seeding date and seeding rate were combined to create a total of ten treatments that were replicated four times at all locations (Table 1).

Table 1. Treatments demonstrated at NARF, WCA, WARC, and ISask in Does seeding date and rate of canola effect spring flea beetle pressure, yield and quality?

Treatment #	Target seed date	Seed rate
1	Ultra early[a]	1X
2		2X
3	Early[b]	1X
4		2X
5	Typical[c]	1X
6		2X
7	Late[d]	1X
8		2X
9	Very late[e]	1X
10		2X

[a]Ultra early seeding will target the last week of April to the 1st week of May
[b]Early will target the 1st two weeks of May
[c]Typical will be the last two weeks of May
[d]Late will target the 1st week of June
[e]Very Late will target the 10th-20th of June

Crop management for the demonstration varied by site. All crop management considerations such as crop protection products, row spacing, cultivar, etc. are provided in Table 2 of the Appendices. The demonstration was managed at all sites using best management practices outside of treatment considerations at the discretion of each site manager.

Data collection for the demonstration consisted of general soil test, environmental conditions, soil temperature at time of seeding, plant emergence, plant density, flea beetle damage, days to maturity, grain yield, and grain quality. A general soil test was taken from each trial location to determine applied fertility needed to achieve a high yielding canola crop. Results of the soil test are provided in Table 3 of the Appendices. Environmental conditions were reported for each location which included monthly average temperatures and total precipitation throughout the growing season as compared to long-term averages for each location. This data was collected from a nearby weather station at each site. Soil temperature at time of seeding was recorded at each site and reported in °C at 8AM and 4PM on the day of each seeding date. Plant emergence was collected by recording the day approximately 75% of the plants had emerged in each seeding date. This date was subtracted from the seeding date to report the days to emergence for each seeding date. Plant density was recorded by counting the plants in four 1-meter crop rows two weeks after crop emergence. The average plants per meter was then divided by row spacing to report the plants/m^2 in each plot. Flea beetle damage was evaluated when the 2^{nd} leaf was visible, but not unfolded, using the flea beetle defoliation guide provided on canolacouncil.org. Flea beetle damage was evaluated for 20 plants in 2 locations per plot. The guide for rating is provided in Figure 1 of the Appendices. Days to maturity was documented for every plot when the majority of plants in each plot reached 60% seed color change. The seeding date was then subtracted from the maturity date of each plot to determine the days to maturity. Grain yield was determined by weighing each harvested plot and converting g/plot to kg/ha equivalents. Grain quality included %oil for every plot. Oil was determined by NIR technology using a cleaned subsample from each harvested plot. Lastly, statistical analysis was completed for each site separately using split-plot analysis in Statistix 10 software.

Results

Environmental conditions:

The environmental conditions at all sites throughout the 2024 growing season were marked by a cool and wet spring, followed by a hot and dry summer (Table 4). Swift Current was the driest, with a total of 163mm of precipitation, which was 81% of the long-term average. May had good precipitation at 74mm at Swift Current, however monthly precipitation was reduced into June, July and August along with high average temperatures. At Outlook, total precipitation was 208mm which was 101% of the long-term. Outlook had a cool and wet spring, with total precipitation doubled in June at 122mm total as compared to the long-term (+57mm). Temperatures were cool in the spring and hot in the summer at Outlook which balanced out the average temperature to be in line with the long-term average of 16°C. Melfort also had very comparable conditions to the long-term average, with 225mm of total precipitation or 99% of the long-term, and average growing season temperature in line with the long-term average of 15°C. Most of the rainfall came in May and June at Melfort, with marked reductions in average rainfall in July and August as compared to the long-term. Cool temperatures in May and June resulted in prolonged wet conditions following rainfall events, followed by hot temperatures in July and August that resulted in very dry soil conditions during crop flowering and maturation. Similar conditions as to Melfort occurred at Scott, however at Scott total growing season precipitation was the greatest at 256mm, which was 118% of the long-term average. The greatest amount of precipitation at Scott occurred in June where precipitation was almost doubled, with a total of 112mm (+50mm of the long-term).

Soil temp at seeding:

Results of soil temp at seeding are provided in Table 5 of the Appendices. Soil temperature at seeding was considered warm enough for canola germination across seeding dates and locations in most instances. Canola council suggests that a good starting point for canola seeding is when the 3-day average soil temperature reaches 4-5°C. Across locations, at Outlook soil temperatures were well above the necessary threshold, reaching a daily average of 12-20°C across seeding dates. Cooler temperatures occurred in late May and early June as compared to Ultra early and early seeding at this site, but were still well above the recommendation. At Melfort, average soil temperature ranged from 9-16°C and at Swift Current average soil temperature ranged from 10-16°C. At Scott, soil temperature at seeding time was missed, therefore temperature was only reported as average air temperature. Average air temperature at Scott ranged from 8-15°C across seeding dates. Across seeding dates at Melfort, Swift Current and Scott daily temperatures were at or well above those needed to suggest soils were warm enough for canola seeding based on canola council recommendations, despite ultra early and early seeding dates.

Plant emergence:

Results of days to plant emergence are provided in Table 5 of the Appendices. Days to plant emergence was greatest when seeding ultra early and tended to decline as seeding date progressed into the spring. This was true at Melfort, Scott, and Swift Current, however at Outlook plant emergence was somewhat consistent across seeding dates. This may have been due to higher seasonal temperatures in May than the other sites. At sites with April seeding (Swift Current and Melfort) days to emergence was the greatest, at over 20 days for both of these locations. At both of these sites, days to emergence tended to steadily decline with each seeding date, reaching 10-11 days by the last seeding date. At Scott, seeding date had a similar trend as to Melfort and Swift Current, however, the ultra early seeding date at Scott was a similar calendar date as to the early date at Melfort and Swift Current, which diminished the days to emergence in comparison.

Results of plant density, flea beetle damage, days to maturity, grain yield and grain quality are provided in Tables 6-9 of the Appendices.

Plant Density:

Plant density averaged at 68, 54, and 76 plants/m² at Melfort, Swift Current and Scott, respectively. At Outlook, average plant densities were not taken; however, stubble counts were completed after harvest, in which average stubble counts were 132 plants/m². Seeding date significantly effected plant density at Melfort ($p=0.0157$), Swift Current ($p=0.0043$), and Scott ($p=0.0075$). At Melfort seeding in early May (May 6) had the greatest plant density as compared to ultra early (April 26) and typical (May 15). This was likely a result of timely rain (18mm within 24 hours of seeding) and warm temperatures (3 days of 20°C highs) following seeding of this treatment. At Scott, a typical seeding date (May 22) had the greatest plant density and at Swift Current late (May 22) had the greatest plant density, but not significantly greater than typical (May 13) and very late (May 30). The inconsistency in plant density differences due to seeding date across sites, suggests that density was affected by individual site conditions more so than exact seeding date. Across sites, seeding ultra early resulted in diminished densities consistently, suggesting that seeding in colder conditions is likely to reduce emergence. This was most prominent at Melfort and Swift Current when ultra early seeding took place in April as compared to ultra early seeding at Scott on May 6. Seeding rate significantly increased plant density at Melfort ($p<0.0001$), Swift Current ($p<0.0001$), and Scott ($p<0.0001$). At all sites, increasing seed rate increased plant density. At Melfort, plant density increased from 48 to 88 plants/m², at Swift Current plant density increased from 43 to 65 plants/m², and at Scott plant density increased from 50 to 102 plants/m². Swift current was the only site to demonstrate a seeding date by rate interaction for plant density ($p=0.02$). The interaction was that seeding rate only significantly increased plant density for the very late (May 30) seeding date. The reasoning for this is uncertain, as most seeding dates at this site had relatively timely precipitation following seeding along with optimal temperatures for germination. At Outlook, there were no significant treatment differences for the stubble counts collected in place of plant density.

Flea Beetle Damage:

Flea beetle damage was 16%, 17%, and 13% on average at Melfort, Swift Current and Scott, respectively. Outlook did not have any flea beetle damage. Seeding date significantly affected flea beetle damage at Melfort ($p<0.0001$), Swift Current ($p=0.0006$), and Scott ($p<0.0001$). There was a similar trend across sites where flea beetle defoliation tended to be greater for earlier seed dates and declined as seeding dates occurred later in the season. At Melfort, seeding early and typical (May 6 & 15) had the greatest flea beetle defoliation as compared to all other seed dates. At Swift Current, seeding ultra early (April 25) had significantly greater flea beetle pressure than seeding late (May 22) and very late (May 30). Swift Current was also the only site to surpass the economic threshold of 25% defoliation at 35% for the ultra early seeding date. At Scott, flea beetle defoliation was greatest at ultra early (May 5) and early (May 14) and was significantly greater than all other dates. Seeding rate significantly affected flea beetle defoliation at Melfort ($p=0.0175$) and Swift Current ($p=0.003$). The result was consistent across locations, where flea beetle defoliation was greater for a 1X seeding rate as compared to 2X. There was no significant interaction of seeding date and rate at any locations.

Days to Maturity:

Days to maturity was 98, 84, 91, and 98 days on average at Melfort, Swift Current, Scott and Outlook respectively. Seeding date significantly affected days to maturity at all locations. At Scott ($p<0.0001$) and Swift Current ($p<0.0001$), days to maturity declined linearly as seeding date progressed from ultra early to very late. At Melfort ($p<0.0001$) and Outlook ($p<0.0001$) a similar result occurred, however at Melfort the typical seeding date had 7 days longer maturity than the early seed date, and at Outlook the typical seed date had 8 days longer maturity than the early seed date. The prolonged maturity of this treatment was likely just a result of environmental conditions at different crop stages, such as cooler temperatures during crop flowering or maturation. Seeding rate only significantly affected crop maturity at Melfort ($p=0.0195$) and Scott ($p=0.0167$). At Melfort, days to maturity was decreased by 1 day when seeding at a 2X rate, and at Scott maturity was decreased by less than 1 day when increasing to a 2X rate. There were no significant interactions of seeding date and rate for maturity at any sites.

Grain yield:

Grainy yield averaged at 2478, 2109, 2001, and 661 kg/ha at Scott, Melfort, Outlook and Swift Current, respectively. Grain yield was significantly affected by seeding date at all locations. At Swift Current ($p<0.0001$) and Scott ($p<0.0001$), grain yield tended to decrease linearly as seeding date progressed from ultra early to very late. At Swift Current, grain yield was greatest at the ultra-early (April 25) seeding date at 1088kg/ha, and yield decreased with each additional seed date down to 179 kg/ha at very late. At Scott, yield was greatest at the ultra-early seeding date with an average of 3369 kg/ha and yield decreased with each additional seed date to 1708 kg/ha at very late. At Melfort ($p=0.0002$), yield was greatest for typical (May 15) and late (May 27) seeding dates as compared to all other dates. At Outlook ($p=0.0187$), yield was greatest for the early (May 15) seed date, which was greater than all other seed dates, except for the typical (May 27) seeding date. The seeding rate only significantly affected yield at Swift Current ($p=0.0051$) and Scott ($p=0.0016$). At both sites, increasing seed rate increased yield. At Swift current, yield was increased by 84 kg/ha and at Scott yield was increased by 170 kg/ha. There were no significant interactions of seed date and rate for yield at any sites.

Quality:

Oil averaged at 44.4%, 36.9%, 41.8%, and 44.1% at Melfort, Swift Current, Scott and Outlook, respectively. Oil was significantly different for seeding date at all sites. At Outlook ($p<0.0001$) oil was greatest for ultra early and declined linearly from ultra early to typical. From a typical seeding date to very late there were no significant differences in oil at Outlook. At Swift Current ($p=0.0093$), oil also declined linearly, where oil was greatest at ultra early and continued to decline with each seeding date all the way to the very late seed date. At NARF ($p<0.0001$), oil again tended to decline linearly, however, there were some outliers. For instance, the ultra-early and early dates had the greatest oil and were statistically similar, however, the late seeding date also had comparable oil to the ultra-early date. Similar to other sites, at NARF, the very late seeding date had the lowest oil of all seed dates. At Scott ($p<0.0001$), oil did not decline linearly as seeding date progressed from ultra early to very late. Early, typical and late seeding dates all had comparable oil, that were significantly greater than ultra early and the very late date at Scott. Scott was to only site to have a significant interaction ($p=0.0137$) for seed date and rate for oil where the late date had significantly greater oil than the early date at a 2X rate only. The ultra early and typical seed dates also had significantly lower oil when the seed rate was increased to 2X.

Extension:

Extension at Melfort included funder and treatment signage at the NARF & AAFC Joint Annual Field Day on July 18th, 2024 with 97 people in attendance. NARF also presented the 2024 results at TopNotch Farming in Hudson Bay and Melfort, SK on February 4th and 5th of 2025. Kaeley Kindrachuk (SK Oilseeds) presented at WCA's Annual Field Day on July 18th, 2024 with 75 people in attendance. Shawn Senko (Canola Council of Canada) and Koralie Mack (WARC) presented the trial at the Scott Field Day on July 10th, 2024 with approximately 100 people in attendance. Alex Waldner (WARC) briefly highlighted the trial results at Crop Opportunity on February 27th, 2025 with 69 people in attendance and 29 people virtually. This project was also included in the Outlook Irrigation Field Day on July 11th, 2024 with approximately 200 attendees at the event.

Conclusions and Recommendations:

Seeding date and rate of canola affected days to emergence, plant density, flea beetle pressure, maturity, yield and % oil across a wide range of Saskatchewan environments. Despite ultra early (late April-early May) and early (early May) seeding, average soil temperatures at seeding time were always near or often above 10°C, which is optimal soil temperatures for seeding of canola. Although soil temperatures were quite warm when ultra early and early seeding, days to emergence still tended to be longer for earlier seed dates, and declined as seeding progressed later into May and early June. The response of plant density to seeding date varied by site, however, seeding in mid-May tended to have higher plant densities across locations as compared to seeding ultra early in late April or early May. Regardless of seeding date, plant densities were always above 40 plants/m^2, which is the lowest canola density able to maintain yield according to Canola Council. Seeding at a 2X rate over a 1X rate also increased plant density at three locations. Stand density was increased by 1.5 to 2X when seeding at a 2X rate as compared to a 1X rate. At Swift Current, there was a significant interaction of seeding date and rate for plant density, where plant density was only significantly increased when seeding rate was increased for the very late seeding date. Flea beetle pressure was significantly affected by seeding date at three locations, where flea beetle pressure was usually greater with early seeding dates, and declined as seeding date progressed from ultra early to very late. At NARF only, flea beetle pressure was greater at the early date as compared to the ultra-early date, but then declined as seeding date progressed from early to very late. Days to maturity was significantly different for seeding date at all sites, where days to maturity declined linearly as seeding date progressed from ultra early to very late. An increased seeding rate also decreased days to maturity at two sites by 1 day. The response of grain yield to seeding date was inconsistent across sites. At two locations, seeding ultra early demonstrated the greatest yields, and yield decreased linearly as seeding date progressed from ultra early to very late. At the other two locations, yield tended to be greatest when seeding early to typical (early-mid May) as compared to ultra early or very late seeding, where yields were diminished. Seeding rate also increased yield at 50% of locations, where yield was increased by 7-14% when increasing seeding rate from a 1X to 2X rate. Lastly, % oil was significantly affected by seeding date at all sites. At two locations, oil tended to decline linearly as seeding date progressed from ultra early to very late. At one location, oil also declined linearly, but only up to the typical seeding date, where oil plateaued for all dates after the typical seeding date. In contrast to the other sites, at WARC oil was significantly greater for the early, typical, and late seed dates as compared to the ultra-early and very late dates. WARC also had a significant interaction for seed date and rate for oil where the late date had significantly greater oil than the early date at a 2X rate only. The ultra early and typical seed dates also had significantly lower oil when the seed rate was increased to 2X. Overall, seeding canola earlier than recommended increased days to emergence, increased flea beetle pressure and increased days to maturity. Grain yield increased 50% of the time when seeding ultra early, and 50% of the time when seeding at an early or more typical seed date for the region. Oil increased 75% of the time when seeding ultra early as compared to a typical seed date. Seed rate increased plant stands, decreased flea beetle pressure, decreased days to maturity, and increased yield 50% of the time.

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Appendices:

Table 2. Dates of operation and crop management for each location in Does seeding date and rate of canola effect spring flea beetle pressure, yield, and quality? in 2024.

Factor/Field Operation	Scott	Swift Current	Outlook	Melfort
Pre-emergent Herbicide	May 4th & June 10th (last date only) Glyphosate 540 1L/ac and AIM 35mL/ac	RoundUp Transorb 0.5L/ac April 29	None	None
Stubble	Wheat	Durum	Wheat	Wheat
Row Spacing	25cm	21cm	25cm	30cm
Cultivar	LL340	DK 400TL	Unsure	PV 661
NPKS kg/ha applied	154-38-14-18	135-67-0-27	135-30-0-0	188-56-0-17
in-crop herbicide	Liberty 1.62L/ac & Centurion 75mL/ac June 10 (TRT 1-6) July 5 (TRT 7-10)	Liberty 1.6L/ac & Centurion 77mL/ac June 11 (TRT 1-6)	Libertly June 5	Liberty 1.6L/ac & Facet L 113mL/ac June 9; Liberty 1.6L/ac & Centurion 150mL/ac June 21
Plant counts	May 30, June 6, 12, 20, 26	May 30, 31, June 12	Stubble counts	May 31, June 4, 10, 18 & 24
Flea beetle ratings	May 28, June 6, 11, 20, 26	May 30, June 12	No pressure to rate	May 31, June 4, 10, 18 & 26
Days to maturity	Aug 12- Sept 3	July 27-Aug 9	Aug 19- Sept 9	August 8 to September 9
Insecticide	None	None	Matador May 30 & June 9 for Grasshopper	None
Fungicide	Cotegra 280mL/ac July 5 (TRT 1-4), July 11 (TRT 5,6), July 19 (TRT 7,8) July 22 (TRT 9,10)	None	None	None
Desiccant	None	None	None	None
Harvest date	Aug 26 (TRT 1,2) Sept 1 (TRT 3-6), Sept 9 (TRT 7,8) Sept 17 (TRT 9,10)	Aug 1 (TRT 1,2) August 15 (TRT 3-10)	09-Sep	September 3 (TRT 1-6) & 9 (TRT 7-10)

Table 3. Soil Residuals for all locations in Does seeding date and rate of canola effect spring flea beetle pressures, yield and Quality? in 2024

Scott							
Depth (cm)	N (lb/ac)	P (ppm)	K (ppm)	S (lb/ac)	OM (%)	pH	Salts (mmho/cm)
0 to 15	17	16	219	22	4	5.4	0.2
15 to 60	12			102		7.8	0.38
Swift Current							
Depth (cm)	N (lb/ac)	P (ppm)	K (ppm)	S (lb/ac)	OM (%)	pH	Salts (mmho/cm)
0 to 15	11	14	248	8	2.7	7.5	0.37
15 to 60	84			24		8.2	0.3
Outlook							
Depth (cm)	N (lb/ac)	P (ppm)	K (ppm)	S (lb/ac)	OM (%)	pH	Salts (mmho/cm)
0 to 15	5	5	393	30	3.1	7.9	0.27
15 to 60	18			20		8.3	0.26
Melfort							
Depth (cm)	N (lb/ac)	P (ppm)	K (ppm)	S (lb/ac)	OM (%)	pH	Salts (mmho/cm)
0 to 15	25	28	402	28	7.9	5.9	0.41
15 to 60	18			66		6.7	0.56

Figure 1. Flea beetle defoliation guide used in the demonstration as found on [Flea Beetles | Canola Encyclopedia]

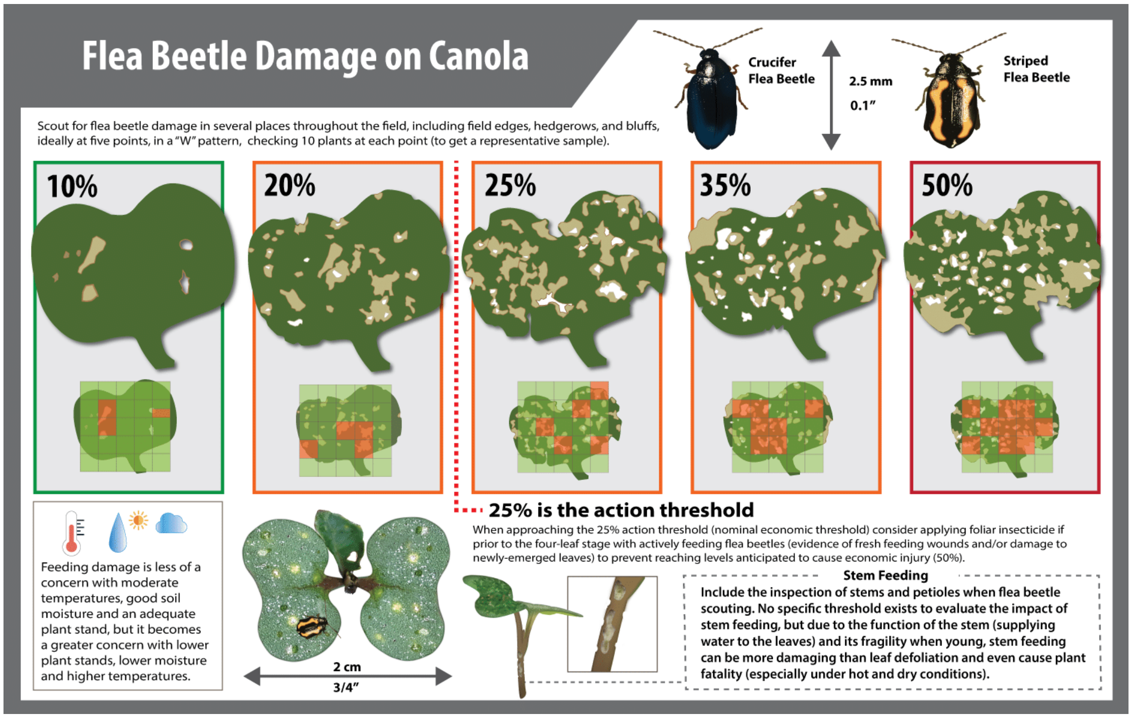

Table 4. Environmental Conditions at all locations for Does seeding date and rate of canola effect spring flea beetle pressure, yield and quality? in 2024.

Location	**Year**	**May**	**June**	**July**	**August**	**Avg/Total**
		--- Total Precipitation (mm) --				
Scott	2024	74.2	112.0	26.7	42.8	255.7
	1981-2010	36.3	61.8	72.1	45.7	215.9
Swift Current	2024	73.6	52.1	18.6	18.2	162.5
	2010-2023	43.4	60.5	56.4	40.4	200.7
Outlook	2024	62.6	122.0	19.1	3.8	207.5
	Irrigation	0.0	12.7	31.4	56.1	100.2
	1993-2023	41.5	65.3	55.8	43.9	206.5
Melfort	2024	73.0	84.0	36.1	31.9	225.0
	1997-2021	33.4	79.5	69.6	45.9	228.4
		--- Mean Temperature (°C) ---				
Scott	2024	9.8	13.3	18.9	17.4	14.9
	1981-2010	10.8	15.3	17.1	16.5	14.9
Swift Current	2024	10.6	14.3	21.3	19.4	16.4
	Long-term	11.5	16.3	19.0	18.6	16.4
Outlook	2024	11.0	14.2	20.4	18.3	16.0
	1993-2023	11.3	16.1	18.9	17.9	16.0
Melfort	2024	10.1	13.2	19.4	17.4	15.0
	1997-2021	10.1	15.2	17.8	16.7	15.0

Table 5. Seeding date, soil temperature, days to emergence and spring or fall frost for all locations in Does seeding date and rate of canola effect spring flea beetle pressure, yield, and quality? om 2024.

	Seeding date:	Ultra Early	Early	Typical	Late	Very late
Scott	Actual Date	05-May-24	14-May-24	22-May-24	02-Jun-24	10-Jun-24
	Soil Temp	8AM 3.4°C; 4PM 11.5°C	8AM 8°C; 4PM 18.8°C (air temps)	8AM 5.5°C; 4PM 11.3°C (air temps)	8AM 10.7°C; 4PM 18.7°C (air temps)	8AM 11.8°C; 4PM 14.5 °C (air temps)
	Days to emerge	16	14	12	10	10
	Spring frost	-0.8 °C on May 12, no frost damage observed				
	Fall frost	None				
Swift Current	Actual Date	25-Apr-24	06-May-24	13-May-24	22-May-24	30-May-24
	Soil Temp	8AM 8.6°C; 4PM 10.3°C	8AM 8.7 °C; 4PM 10.4°C	8AM 12.6°C; 4PM 18.3°C	8AM 12.7°C; 4PM 14.5°C	8AM 12.8°C; 4PM 13.2°C
	Days to emerge	24	17	14	11	10
	Spring frost	was -0.2°C May 2-4, but no frost damage observed				
	Fall frost	None				
Outlook	Actual Date	09-May-24	15-May-24	24-May-24	03-Jun-24	13-Jun-24
	Soil Temp	8AM 17°C; 4PM 22°C	8AM 17.3°C; 4PM 22.7°C	8AM 7.3°C; 4PM 16.2°C	8AM 11.3°C; 4PM 15.7°C	8AM 12.1°C; 4PM 26.1°C
	Days to emerge	14	18	15	12	9
	Spring frost	None				
	Fall frost	None				
Melfort	Actual Date	26-Apr-24	06-May-24	15-May-24	27-May-24	07-Jun-24
	Soil Temp	8AM 8.5°C(air) 4PM 13.1°C	8AM 5.8°C; 4PM 11.4°C (air)	8AM 13.4°C; 4PM 18°C	8AM 8.9°C; 4PM 17.1°C	8AM 11°C; 4PM 13.7°C
	Days to emerge	21	18	16	11	11
	Spring frost	reached -0.7°C May 25, but no signs of severe frost damage				
	Fall frost	No fall frosts				

Table 6. The results of the analysis of variance (ANOVA) at Melfort (NARF) for Does seeding date and rate of canola effect spring flea beetle pressure, yield and quality? Treatment means followed by a different letter are significantly different at $p<0.05$ using LSD for treatment comparison.

NARF												
	Plant Density		**Flea Beetle Defoliation**		**Maturity**		**Yield**				**Oil**	
	plants/m²		**%**		**Days to**		**KG/HA**		**BU/AC**		**%**	
Seed Date (p-value)	0.0157*		<0.0001***		<0.0001***		0.0002***				0.0001***	
Seed Rate (p-value)	<0.0001***		0.0175*		0.0195*		0.5334				0.9455	
Date*Rate (p-value)	0.2531		0.4603		0.6386		0.9259				0.8818	
Grand Mean	68		16		98		2109		38		44.4	
CV	16.87		12.59		1.72		33.24				2.52	
Seed date												
Ultra early	55	C	14	B	106	A	1688	B	30	B	45.4	AB
Early	82	A	24	A	97	C	1877	B	33	B	45.5	A
Typical	61	BC	20	A	104	B	2704	A	48	A	43.8	C
Late	69	ABC	12	BC	94	D	2640	A	47	A	44.6	BC
Very Late	74	AB	9	C	93	D	1637	B	29	B	42.8	D
Seed rate												
1X	48	B	17	A	99	A	2029	A	39	A	44.4	A
2X	88	A	15	B	98	B	2189	A	36	A	44.4	A
*Date*Rate*												
Ultra early 1X	38	E	15	BC	107	A	1792	ABC	32	ABC	45.3	AB
Ultra early 2X	72	BC	13	BCD	105	AB	1584	C	28	C	45.4	AB
Early 1X	55	CDE	25	A	97	C	1714	BC	31	BC	45.8	A
Early 2X	109	A	23	A	96	CD	2040	ABC	36	ABC	45.1	AB
Typical 1X	39	E	22	A	104	B	2654	AB	47	AB	43.9	BC
Typical 2X	84	B	19	AB	103	B	2754	A	49	A	43.8	BC
Late 1X	52	DE	12	CD	94	DE	2551	AB	45	AB	44.3	B
Late 2X	86	B	12	BCD	94	E	2729	A	49	A	44.8	AB
Very Late 1X	58	CD	10	CD	94	DE	1435	C	26	C	42.7	C
Very Late 2X	89	B	8	D	91	F	1840	ABC	33	ABC	42.8	C

Table 7. The results of the analysis of variance (ANOVA) at Swift Current (WCA) for Does seeding date and rate of canola effect spring flea beetle pressure, yield and quality? Treatment means followed by a different letter are significantly different at p<0.05 using LSD for treatment comparison.

WCA												
	Plant Density		**Flea Beetle Defoliation**		**Maturity**		**Yield**				**Oil**	
	plants/m²		**%**		**Days to**		**KG/HA**		**BU/AC**		**%**	
Seed Date (p-value)	0.0043**		0.0006***		<0.0001***		<0.0001***		<0.0001***		0.0093**	
Seed Rate (p-value)	<0.0001***		0.0003***		0.3332		0.0051**		0.0051**		0.0749	
Date*Rate (p-value)	0.0200*		0.0826		0.4380		0.1681		0.1681		0.8562	
Grand Mean	54		22		84		661		12		36.9	
CV	18.45		17.00		0.38		12.25		12.25		2.16	
Seed date												
Ultra early	42	B	35	A	93	A	1088	A	19	A	37.8	A
Early	47	B	25	AB	88	B	869	B	15	B	37.6	AB
Typical	56	AB	23	AB	87	C	658	C	12	C	36.7	ABC
Late	69	A	16	B	79	D	509	C	9	C	36.2	BC
Very Late	57	AB	13	B	71	E	179	D	3	D	36.0	C
Seed rate												
1X	43	B	25	A	83	A	619	B	11	B	36.6	A
2X	65	A	19	B	84	A	703	A	13	A	37.1	A
*Date*Rate*												
Ultra early 1X	33	E	40	A	93	A	1172	A	21	A	37.9	A
Ultra early 2X	51	BCDE	30	A	93	A	1005	AB	18	AB	37.9	A
Early 1X	39	DE	27	A	88	B	875	BC	16	BC	37.7	A
Early 2X	54	ABCDE	22	A	87	BC	863	BC	15	BC	37.3	A
Typical 1X	45	CDE	28	A	87	C	699	CD	12	CD	36.7	A
Typical 2X	68	ABC	19	A	87	C	618	CD	11	CD	36.7	A
Late 1X	63	ABCD	13	A	79	D	588	CD	10	CD	36.6	A
Late 2X	74	AB	13	A	79	D	430	DE	8	DE	36.3	A
Very Late 1X	33	E	17	A	71	E	180	E	3	E	35.8	A
Very Late 2X	80	A	14	A	71	E	179	E	3	E	35.7	A

Table 8. The results of the analysis of variance (ANOVA) at Scott (WARC) for Does seeding date and rate of canola effect spring flea beetle pressure, yield and quality? Treatment means followed by a different letter are significantly different at p<0.05 using LSD for treatment comparison.

WARC												
	Plant Density		**Flea Beetle Defoliation**		**Maturity**		**Yield**				**Oil**	
	plants/m²		**%**		**Days to**		**KG/HA**		**BU/AC**		**%**	
Seed Date (p-value)	0.0075**		<0.0001***		<0.0001***		<0.0001***				<0.0001***	
Seed Rate (p-value)	<0.0001***		0.1479		0.0167*		0.0016**				0.1226	
Date*Rate (p-value)	0.4239		0.8862		0.818		0.9771				0.0137*	
Grand Mean	76		13		91		2478		44		41.8	
CV	24.80		41.27		1.03		5.62		5.62		1.57	
Seed date												
Ultra early	74	BC	24	A	100	A	3369	A	60	A	40.3	B
Early	69	C	22	A	93	B	3088	B	55	B	42.6	A
Typical	86	A	8	B	90	C	2453	C	44	C	43.3	A
Late	82	AB	8	B	88	D	1772	D	32	D	43.3	A
Very Late	68	C	2	C	84	E	1708	D	30	D	39.5	B
Seed rate												
1X	50	B	14	A	91	A	2393	B	43	B	41.9	A
2X	102	A	11	A	91	B	2563	A	46	A	41.6	A
*Date*Rate*												
Ultra early 1X	41	D	27	A	101	A	3260	B	58	B	41.0	DE
Ultra early 2X	108	AB	22	A	100	A	3478	A	62	A	39.6	F
Early 1X	53	D	23	A	94	B	3002	C	53	C	42.9	ABC
Early 2X	84	C	20	A	93	B	3175	BC	57	BC	42.2	CD
Typical 1X	56	D	8	B	91	C	2363	D	42	D	43.8	A
Typical 2X	116	A	7	B	90	CD	2543	D	45	D	42.8	BC
Late 1X	55	D	9	B	88	D	1700	EF	30	EF	42.9	ABC
Late 2X	109	AB	7	B	88	D	1844	E	33	E	43.6	AB
Very Late 1X	44	D	2	B	84	E	1640	F	29	F	39.1	F
Very Late 2X	93	BC	2	B	83	E	1775	EF	32	EF	39.8	EF

Table 9. The results of the analysis of variance (ANOVA) at Outlook (ISask) for Does seeding date and rate of canola effect spring flea beetle pressure, yield and quality? Treatment means followed by a different letter are significantly different at p<0.05 using LSD for treatment comparison.

Isask												
	Plant Density (Stubble counts)		Flea Beetle Defoliation		Maturity		Yield				Oil	
	plants/m²		%		Days to		KG/HA		BU/AC		%	
Seed Date (p-value)	0.4937		--		<0.0001***		0.0187*				<0.0001***	
Seed Rate (p-value)	0.8584		--		0.1407		0.1387				0.9049	
Date*Rate (p-value)	0.8274		--		0.1567		0.4763				0.3786	
Grand Mean	132		0		98.225		2001		36		44.1	
CV	27.31		--		0.52		15.02				1.42	
Seed date												
Ultra early	132	A	0		102	B	1789	BC	32	BC	45.6	A
Early	122	A	0		98	C	2588	A	46	A	44.8	B
Typical	116	A	0		106	A	2265	AB	40	AB	43.5	C
Late	141	A	0		97	D	1912	BC	34	BC	43.2	C
Very Late	148	A	0		88	E	1451	C	26	C	43.2	C
Seed rate												
1X	131	A	0		98	A	1927	A	34	A	44.1	A
2X	133	A	0		98	A	2075	A	37	A	44.1	A
*Date*Rate*												
Ultra early 1X	142	A	0		102	B	1825	BC	32	BC	45.7	A
Ultra early 2X	122	A	0		103	B	1754	BC	31	BC	45.4	A
Early 1X	114	A	0		98	CD	2362	AB	42	AB	44.8	A
Early 2X	131	A	0		98	C	2813	A	50	A	44.9	A
Typical 1X	118	A	0		106	A	2148	ABC	38	ABC	43.4	B
Typical 2X	114	A	0		106	A	2382	AB	42	AB	43.5	B
Late 1X	141	A	0		98	DE	1853	BC	33	BC	42.9	B
Late 2X	141	A	0		97	E	1970	BC	35	BC	43.6	B
Very Late 1X	139	A	0		87	F	1445	C	26	C	43.5	B
Very Late 2X	157	A	0		88	F	1457	C	26	C	42.9	B

Abstract:

To evaluate the effect of seeding date and rate on canola flea beetle pressure, yield and quality a demonstration was conducted near Melfort (NARF), Outlook (ISask), Swift Current (WCA), and Scott (WARC), SK in 2024. The demonstration was small plot with four replications. The design was a split-plot with seed date as the main plot and seed rate as the sub-plot. Five different seeding dates were used (Ultra early, early, typical, late and very late) in combination with two different seeding rates (1X and 2X) to create ten treatments. Data collection was soil temp at seeding time, days to emergence, plant density, flea beetle pressure, days to maturity, grain yield and %oil. On average across locations, seeding canola early increased days to emergence, decreased plant density, increased flea beetle pressure, increased days to maturity, increased grain yield (50% of the time), and increased % oil as compared to a typical seed date. An increased seeding rate often increased plant density, decreased flea beetle pressure, decreased days to maturity, and increased yield (50% of the time). There were very rarely significant interactions of seeding date and seeding rate.

Extension:

Extension at Melfort included funder and treatment signage at the NARF & AAFC Joint Annual Field Day on July 18th, 2024 with 97 people in attendance. NARF also presented the 2024 results at TopNotch Farming in Hudson Bay and Melfort, SK on February 4th and 5th of 2025. Kaeley Kindrachuk (SK Oilseeds) presented at WCA's Annual Field Day on July 18th, 2024 with 75 people in attendance. Shawn Senko (Canola Council of Canada) and Koralie Mack (WARC) presented the trial at the Scott Field day on July 10th, 2024 with approximately 100 people in attendance. Alex Waldner (WARC) briefly highlighted the trial results at Crop Opportunity on February 27th, 2025 with 69 people in attendance and 29 people virtually. This project was also included in the Outlook Irrigation Field Day on July 11th, 2024 with approximately 200 attendees at the event.

Finances:

Producer group: Western Applied Research Corporation

	Total funds required for the project	Funds requested Year 1	Funds requested Year 2	Total Funds Used
Salaries and Benefits				
Students	$2,200	$2,200		$2,200
Postdoctoral / Research Associates				$0
Technical / Professional Assistants	$3,900	$3,900		$3,900
Consultant Fees & Contractual Services				$0
Rentals				$0
Materials / Supplies	$2,000	$2,000		$2,000
Project Travel				
Field Work				$0
Collaborations/consultations				$0
Other				
Field Day				$0
Administration				$0
Miscellaneous	$500	$500		$500
Total	$8,600	$8,600	$0	$8,600

Producer group: Wheatland Conservation Area

	Total funds required for the project	Funds requested Year 1	Funds requested Year 2	Total Funds Used
Salaries and Benefits				
Students	$2,200	$2,200		$2,200
Postdoctoral / Research Associates				$0
Technical / Professional Assistants	$3,900	$3,900		$3,900
Consultant Fees & Contractual Services				$0
Rentals				$0
Materials / Supplies	$2,000	$2,000		$2,000
Project Travel				
Field Work				$0
Collaborations/consultations				$0
Other				
Field Day				$0
Administration				$0
Miscellaneous	$500	$500		$500
Total	$8,600	$8,600	$0	$8,600

Students & Technical Assistants: All funds allocated to students and technical assistants covered the cost of wages for labour associated with the demonstration for summer students, seasonal staff, and fulltime staff at WCA and WARC
Materials/supplies: This covered all costs associated with supplies needed to mark out, seed, maintain, harvest and complete data collection for the demonstration.
Miscellaneous: At WARC and WCA, rent and extension expenses may differ, so this was itemized under miscellaneous to account for differences between sites. For some this may be used to cover higher costs of wages, rent, extension, and general costs associated with differences in the cost of operation for each site.