2018 Annual Report

for the

Agricultural Demonstration of Practices and Technologies (ADOPT) Program

Project Title: Seeding Rate and Row Spacing Effects on Faba bean Establishment, Competitiveness with Weeds, Maturity & Yield

(Project #20170411)

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Project Identification

1. **Project Title:** Seeding rate and row spacing effects on faba bean establishment, competitiveness with weeds, maturity, and yield
2. **Project Number:** 20170411
3. **Producer Group Sponsoring the Project:** Indian Head Agricultural Research Foundation
4. **Project Location(s):** Indian Head, Saskatchewan, R.M. #156
5. **Project start and end dates (month & year):** April-2018 to February-2019
6. **Project contact person & contact details:**

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Objectives and Rationale

7. **Project objectives:**

The primary objective of this project was to demonstrate the response of faba beans to varying row spacing with a focus on establishment, ability to compete with weeds, maturity and yield. An additional objective was to demonstrate optimal seeding rates and assess whether the seeding rate responses might be affected by row spacing.

8. **Project Rationale:**

While seeded acres are still quite small in Saskatchewan and faba beans are not particularly well adapted to drier areas of the province, they are an excellent fit agronomically for growers in cooler, wetter regions. In 2016, approximately 51,000 acres of faba beans were grown in the province with the majority of the production in the northeast and very little in the southwest. This is mainly due to the wetter conditons in the north and east regions of the province which is ideal for faba beans but creates major challenges with more traditional pulses like field peas or lentils. That being said, faba beans are also a relatively late maturing crop which should be seeded early which can potentially be problematic in more northern environments. Factors such as row spacing and seeding rate have potential to not only impact the crop's ability to compete with weeds and yield but also maturity. Although faba bean research in western Canada has been limited, examples do exist both from the Prairies and other faba bean producing regions of the world.

Dr. Steve Shirtliffe and Jessica Pratchler (University of Saskatchewan/NARF), in collaboration with multiple Agri-ARM sites, evaluated a wide range of seeding rates over three growing seasons (2015-17). Results varied with environmental conditions and faba bean types but generally showed that the most consistent yields were achieved at seeding rates of 44-55 seeds/m^2. Yields either levelled off or even declined slightly when seeding rates were increased beyond this point. Although faba beans have the ability to compensate quite well for lower populations through increased branching and extended flowering, maturity can be delayed and the crop's ability to compete with weeds has also been noticeably poorer at the lower populations. Using Clearfield wheat to simulate weed competition, additional work completed at the University of Saskatchewan (Schroeder and Syrovy 2017) compared faba bean response to seeding rate under weedy versus weed free conditions. Preliminary results of this work found

that faba bean biomass increased with seeding rate but was reduced by an average of 68% under heavy weed competition. Wheat (as a weed) yields were reduced by 28% when the seeding rate was increased from 20 to 60 seeds/m^2. Faba bean yields tended to level off at 40 seeds/m^2 under weed free conditions but increased linearly (through 60 seeds/m^2) with seeding rate under heavy weed competition. As expected, yields were always lower in the weedy environment but by a margin of 72% at 20 seeds/m^2 compared to only 45% at 60 seeds/m^2. Under very dry conditions in north Syria, faba bean yields at 22 seeds/m^2 ranged from only 28-73% of those that were achieved at 45 seeds/m^2 (Silim and Saxena 1993).

Previous row spacing research with faba beans is either quite dated or from other faba bean producing regions of the world, but does exist. Near Edmonton, Kondra (1975) grew faba beans grown at either 15, 23 or 31 cm row spacing and found that yields were 14% lower at the widest row spacing (5882 kg/ha compared to the narrowest row spacing (6842 kg/ha); however, with only one site-year, this can hardly be considered conclusive. Under very dry conditions in North Syria, Silim and Saxena (1993) compared row spacing of 22 cm and 45 cm and found that, when seeding rates were adequate, yields at the wider spacing were only 64-69% of those achieved with narrow spacing. The effects of row spacing were less consistent at sub-optimal seeding rates. In contrast, under much wetter conditions in the U.K., Pilbeam et al. (1989) did not see any effect of row spacing levels ranging from 12-48 cm on seed yield but did note slightly higher seedling mortality at wider row spacing which has also been observed with other crops.

Kondra, Z. 1975. Effects of row spacing, seeding rate and date of seeding on faba beans. Can. J. Plant Sci. **55:** 211-214.

Pilbeam, C., Hebblethwaite, P. and A. Clark. 1989. Effect of different inter-row spacings on faba beans of different form. Field Crops Res. **21:** 203-214.

Schroeder, C. and L. Syrovy. 2017. Increasing faba bean (*Vicia faba*) seeding rate under weedy and weed free conditions. Online [Available]: https://harvest.usask.ca/bitstream/handle/10388/8729/C.%20Schroeder%20and%20L.%20Syrovy%2C%202017.pdf?sequence=1&isAllowed=y (December 13, 2018).

Silim, S. and M. Saxena. 1993. Yield and water use efficiency of faba bean sown at two row spacings and seed densities. Expl. Agric. **29:** 173-181.

Methodology and Results

9. Methodology:

A field trial was initiated in the spring of 2018 near Indian Head, Saskatchewan (50.546 N, 103.571 W) to evaluate row spacing effects on faba beans and potential interactions with seeding rates. Indian Head is situated in the thin-Black soil zone of southeast Saskatchewan and the soil is classified as an Indian Head clay with typical organic matter concentrations of 4.5-5.5%. While this location falls outside of the more traditional faba bean producing regions in Saskatchewan, this crop is known to be well-adapted to the thin-Black soil zone provided that moisture availability, which can be variable, is adequate. The treatments were a combination of four row spacing levels ranging from 25-41 cm (10-16") and three seed rates where the targets were 25, 45, and 65 seeds/m^2 (110-285 kg/ha; 404 g/1000 seeds, 92% germination). The twelve treatments were arranged in a Randomized Complete Block Design (RBCD) with four replicates and are listed in Table 1.

Table 1. Faba bean row spacing and seeding rate treatments demonstrated at Indian Head in 2018

#	Row Spacing	Seeding Rate
1	25 cm (10”)	25 seeds/m^2
2	25 cm (10”)	45 seeds/m^2
3	25 cm (10”)	55 seeds/m^2
4	30 cm (12”)	25 seeds/m^2
5	30 cm (12”)	45 seeds/m^2
6	30 cm (12”)	55 seeds/m^2
7	36 cm (14”)	25 seeds/m^2
8	36 cm (14”)	45 seeds/m^2
9	36 cm (14”)	55 seeds/m^2
10	41 cm (16”)	25 seeds/m^2
11	41 cm (16”)	45 seeds/m^2
12	41 cm (16”)	55 seeds/m^2

The row spacing treatments were implemented using a specially designed SeedMaster plot drill where the eight openers can be repositioned along the frame of the unit as required to achieve several distinct row spacing levels. Consequently, plot widths and harvest areas varied with row spacing. An illustration of the possible configurations and resulting plot widths is provided in Fig. 1.

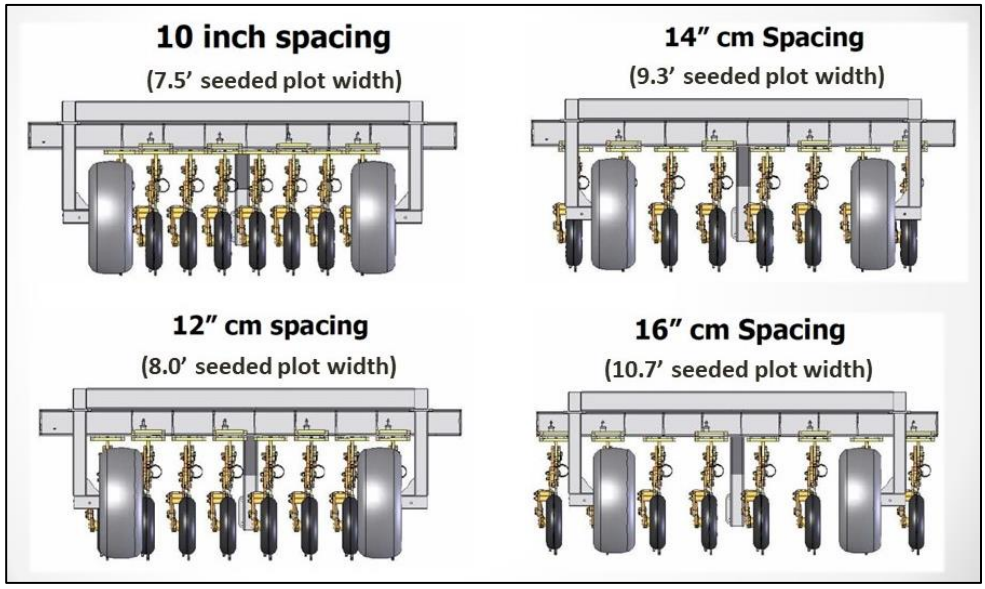

Figure 1. Illustration of the 8-opener SeedMaster plot drill on 25-41 cm (10-16”) row spacing configurations.

Selected agronomic information is provided in Table 2. The variety Snowbird (low tannin, medium seed size) was direct-seeded approximately 3.5 cm (1.3”) deep into canaryseed stubble with seeding rates and row spacing varied as per protocol. The seed was treated with imidacloprid (StressShield) to protect

against pea leaf weevils which were observed in relatively high numbers in 2017. Fertility was intended to be non-limiting with 21-55-10-10 kg N-P_2O_5-K_2O-S/ha applied at seeding and a 2x label rate of Nodulator® FB Peat inoculant applied to the seed. Fertilizer was side-banded with the exception of 11-52-0 which was split between the seedrow and side-band. Weeds were controlled using registered pre-emergent and in-crop herbicide applications but no hand-weeding was permitted. Foliar fungicide was applied preventatively at mid-bloom to ensure disease was non-limiting and no foliar insecticide applications were applied. While some cutworm activity was noted in the early spring, the pressure was not considered high enough to justify control measures. As a matter of interest, no pea leaf weevil was observed in 2018. Pre-harvest glyphosate was applied when approximately 50-60% of the pods had turned black in the latest maturing treatments. The centre six rows of each plot were straight-combined where possible; however, less than six rows were harvested in a few plots due to plugs during seeding.

Table 2. Selected agronomic information for faba bean row spacing demonstration at Indian Head (2018).

Factor / Field Operation	**Indian Head 2018**
Previous Crop	Canaryseed
Pre-emergent herbicide	894 g glyphosate/ha + 140 g sulfentrazone /ha May-14-2018
Variety	Snowbird
Seeding Date	May-10-2018
Seed Treatment	62 g imidacloprid/100 kg seed
Inoculant	250 g Nodulator® FB Peat/100 kg seed
kg N-P_2O_5-K_2O-S ha^{-1}	21-55-10-10
Emergence Counts	May-30-2018
In-crop Herbicide	15 g imazamox/ha + 15 g imazethapyr/ha Jun-6-2018
Foliar Fungicide	75 g fluxapryroxad/ha + 150 g pyraclostrobin/ha Jun-30-2018
Weed Ratings	Jul-26-2018
Pre-harvest herbicide	894 g glyphosate/ha Aug-10-2018
Harvest date	Aug-20-2018

Various data were collected over the growing season and from the harvested seed samples. To assess emergence, the number of plants in 4 x 1 m sections of crop row were counted after emergence was complete and the values were averaged and converted to plants/m^2. Grain yields were determined from the harvested grain samples and are corrected for dockage and to a uniform moisture content of 16%. To assess seed size, a minimum of 500 seeds were counted and weighed to the nearest 0.00 g and the values

were used to calculate g/1000 seeds. Daily temperatures and precipitation were acquired from the nearest Environment Canada weather station located approximately 6 km from the field site. All response data were analysed using the Mixed procedure of SAS with the effects of row spacing (RS), seeding rate (SR) and their interaction (RS × SR) considered fixed and replicate effects treated as random. Individual treatment means were separated using Fisher's protected LSD test and orthogonal contrasts were used to determine whether the observed responses to row spacing and seeding rate were linear or quadratic (curvilinear) with additional contrasts used to describe the seeding rate response at each row spacing level. All treatment effects and differences between means were considered significant at $P \leq 0.05$.

10. Results:

Growing season weather

Weather data for the 2018 growing season at Indian Head is presented with the long-term (1981-2010) averages in Table 3. It was initially drier than normal but with enough soil moisture for germination and seeding conditions were considered excellent overall. While there was essentially no precipitation through early May, 24 mm was received towards the end of the month leading to good overall emergence. Total precipitation in June was 116% of the long-term (1981-2010) average with 90 mm received over the course of the month. The remainder of the season was very dry with less than 50% of the long-term average in July and essentially no precipitation in August. A total of 148 mm of rainfall was received over the four month period (May-August), 61% of the long-term average. Temperatures were well above average in May and, to a lesser extent, June but relatively cool in July and approximately average in August. Averaged over the four months the mean temperature in 2018 was 16.4 °C while the long-term average was 15.6 °C.

Table 3. Mean monthly temperatures and precipitation amounts along with long-term (1981-2010) averages for the 2018 growing season at Indian Head, SK.

Year	May	June	July	August	Avg. / Total
	---------- Mean Temperature (°C) ----------				
IH-2018	13.9	16.5	17.5	17.6	16.4
IH-LT	10.8	15.8	18.2	17.4	15.6
	---------- Precipitation (mm) ----------				
IH-2018	23.7	90.0	30.4	3.9	148
IH-LT	51.8	77.4	63.8	51.2	244

Field Trial Results

Results for the overall tests of fixed effects are presented in Table 4. The effect of row spacing was not significant at the desired probability for any variables (P = 0.066-0.990) but the seeding rate effect was highly significant in all cases (P < 0.001-0.018). Since there were no significant interactions (P = 0.143-0.990), only the main effect (row spacing and seeding) results are provided below while detailed results tables are deferred to the appendices (Tables 5-6).

Table 4. Overall tests of fixed effects (row spacing, seeding rate and their interaction) for various faba bean response variables. Probability values less than 0.05 indicate that an effect was not statistically significant.

Source	Plant Density	Weed Rating	Days to Maturity	Seed Yield	Seed Size
	p-values				
Row Spacing (RS)	0.134	0.377	0.308	0.066	0.696
Seed Rate (SR)	<0.001	<0.001	<0.001	0.018	0.001
RS × SR	0.923	0.403	0.328	0.143	0.990

It is common to observe higher seedling mortality at any given seed rate when row spacing is increased; however, any such effects were minor and only marginally significant in the current project. The overall F-test was not significant (P = 0.134) and neither was the linear contrast (P = 0.196); however, the quadratic response (P = 0.053) suggested a subtle reduction in mortality (i.e. higher plant densities) at the narrowest row spacing (Fig. 1; Table 5). The observed values were 41 plants/m^2 at 25 cm compared to 36-37 plants/m^2 at 30-41 cm row spacing. Across seeding rates and row spacing treatments, the estimated mortality was 17%.

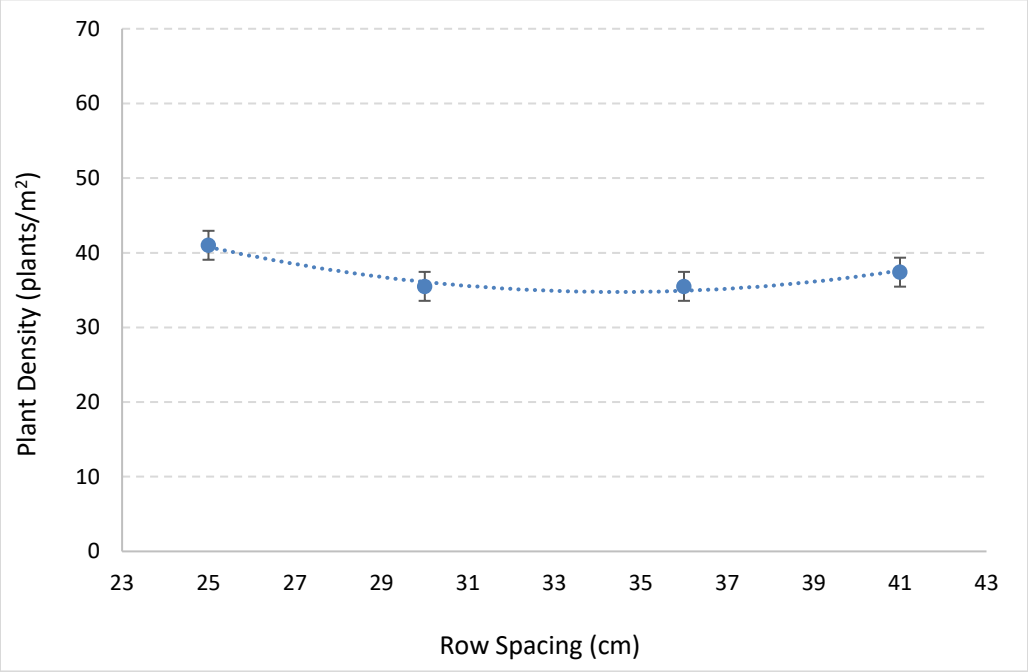

Figure 2. Row spacing effects on faba bean plant density when averaged across seeding rates. While the overall F-test was not significant (P = 0.134), the quadratic response was marginally significant (P = 0.053). Error bars are the standard error of the treatment means (S.E.M.)

Plant densities increased linearly (P < 0.001) but not quadratically (P = 0.237) with seed rate (Fig. 3) and there appeared to be lower mortality at 25 seeds/m^2 (9%) but similar mortality for the 45-65 seeds/m^2 rates (18-20%). It is common for seedling mortality to increase with seed rate due to the higher

competition amongst individual seedlings, similar to what can occur as row spacing is increased. Based on previous experience, these plant populations were likely to be limiting to yield at the 25 seeds/m^2 rate but not at 45 seeds/m^2 or higher.

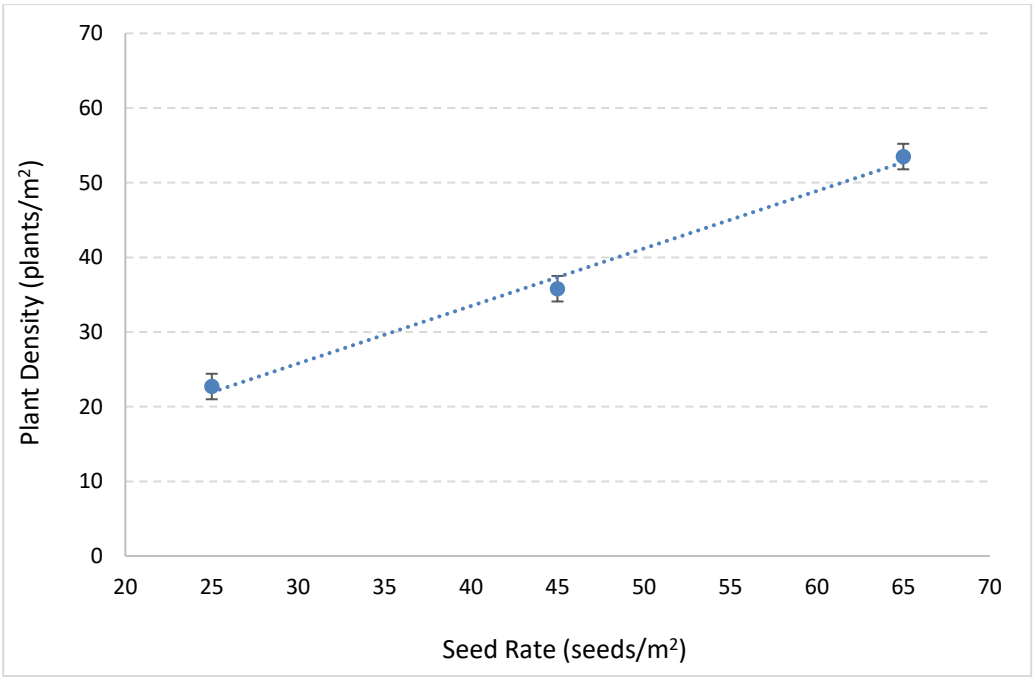

Figure 3. Seed rate effects on faba bean plant density when averaged across row spacing treatments. Both the overall F-test (*P* < 0.001) and linear responses (*P* < 0.001) were highly significant.

Weed populations were low throughout the season with sufficient spring rainfall to activate the pre-emergent sulfentrazone and trigger many of the weeds to emerge prior to the in-crop herbicide application. Late-season weed ratings were completed and did not show any impact of row spacing but did suggest that the majority of the weed escapes occurred at the lowest seeding rate. In theory, crops planted at wider row spacing will take longer to achieve canopy closure which can reduce their ability to compete with weeds and increase reliance on herbicides; however, the actual importance of crop competition in practice and impact on yields will vary with the specific weed populations, herbicide practices, and environmental conditions.

On average, the faba beans matured in ninety days, somewhat earlier than normal due to the lack of moisture through the latter half of the season. Maturity was virtually identical across row spacing treatments (Fig. 4) with no significant F-test (P = 0.308) or orthogonal contrasts (*P* = 0.206-0.225). Each incremental increase in seeding rate resulted in earlier maturity but the response was quadratic (*P* < 0.001) showing the greatest impact going from 25 to 45 seeds/m^2 and a smaller, further reduction going from 45 to 65 plants/m^2 (Fig. 4). The observed range in maturities was small in practical terms: 92, 90 and 89 days for 25, 45 and 65 seeds/m^2, respectively; however, the impact would have likely been substantially greater if conditions had not been so dry late in the season.

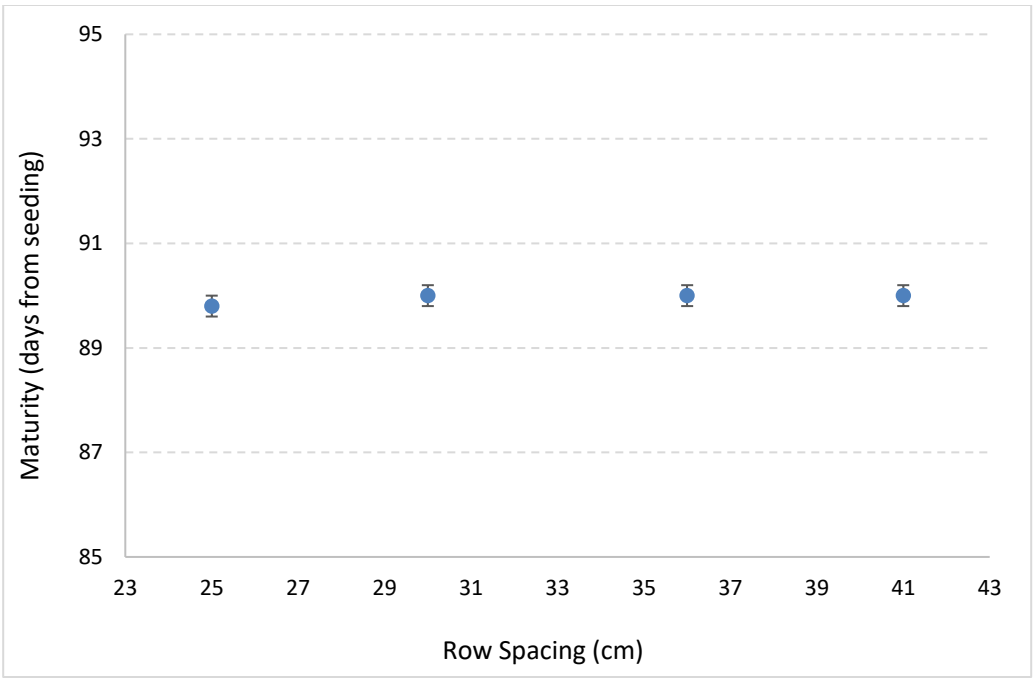

Figure 4. Row spacing effects on faba bean maturity when averaged across seeding rates. Neither the overall F-test (*P* = 0.308) nor any orthogonal contrasts (*P* = 0.206-0.225) were significant. Error bars are the standard error of the treatment means (S.E.M.)

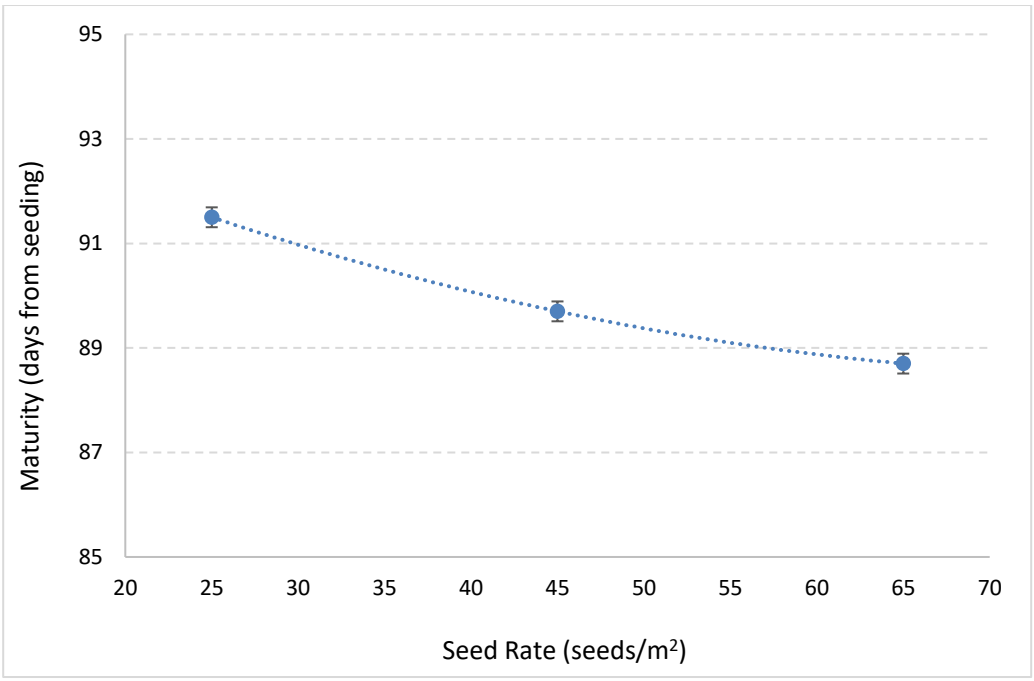

Figure 5. Seed rate effects on faba bean maturity when averaged across row spacing treatments. Both the overall F-test (*P* < 0.001) and quadratic responses (*P* < 0.001) were highly significant. Error bars are the standard error of the treatment means (S.E.M.)

Yields were considered below average under the dry conditions with an overall mean of 1956 kg/ha (29 bu/ac). Although the overall F-test for row spacing effects on seed yield was not quite significant (*P* =

0.066), the orthogonal contrasts detected a subtle quadratic response (P = 0.010) where yields were slightly higher at 25 cm and 41 cm row spacing (1989-2025 kg/ha) than at 30-36 cm spacing (1898-1912 kg/ha). This response is difficult to explain biologically and, with no significant F-test or differences amongst individual treatment means, may not have been a true row spacing effect. The actual range of observed yields was 127 kg/ha (1.9 bu/ac) but the yield difference between the 25 cm and 46 cm treatments was only 36 kg/ha (0.5 bu/ac) and favoured the widest row spacing treatment.

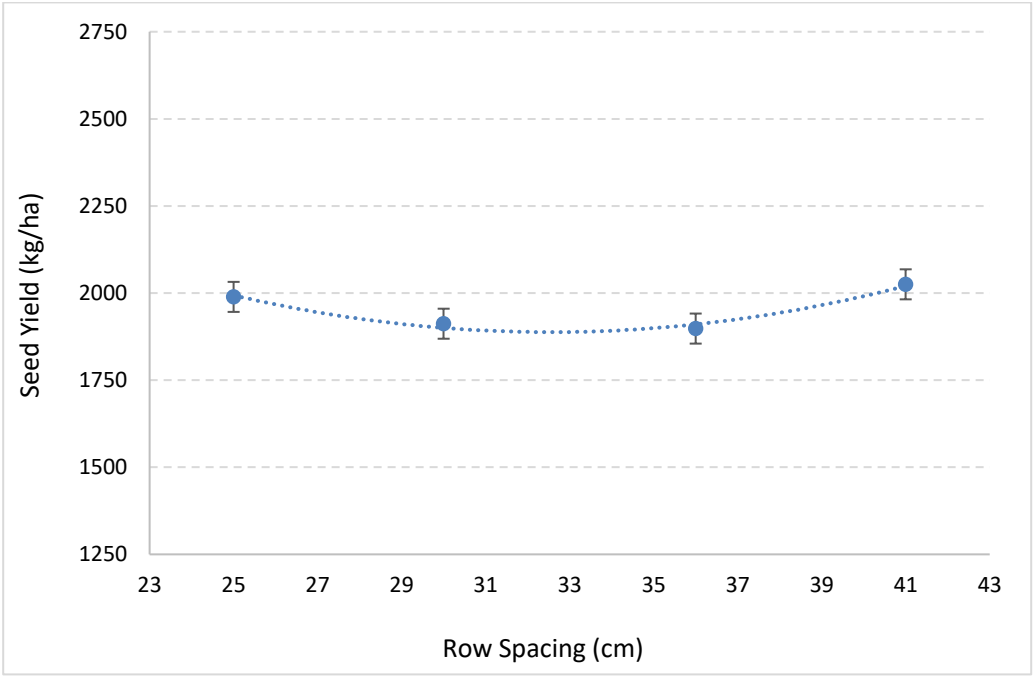

Figure 6. Row spacing effects on faba bean seed yield when averaged across seeding rates. While the overall F-test was not quite significant at the desired probability (P = 0.066), the quadratic orthogonal contrast was significant (P = 0.010) was significant. Error bars are the standard error of the treatment means (S.E.M.)

Somewhat unexpectedly, faba bean seed yield increased linearly with seeding rate (P < 0.001) but not quadratically (P = 0.215; Fig. 7). It is possible that the minimum plant population to optimize yield was higher than normal under the extremely dry conditions. Despite the statistical significance, the magnitude of the response was modest ranging from 1885 kg/ha (28 bu/ac) to 2024 kg/ha (30 bu/ac) and seed costs would have to be considered to determine the economically optimum seeding rate.

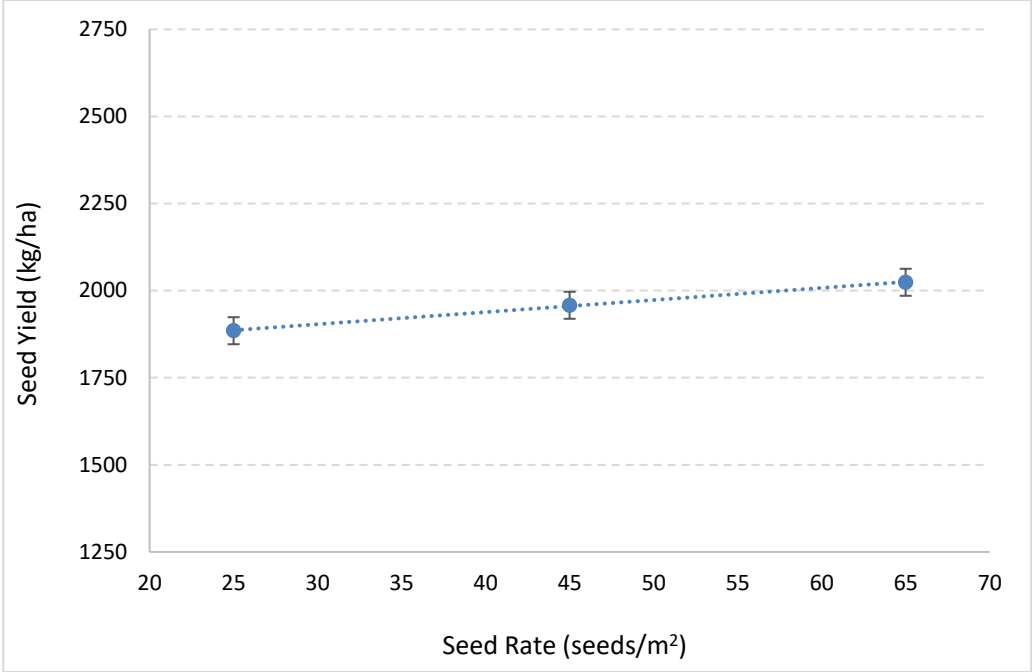

Figure 7. Seed rate effects on faba bean seed yield when averaged across row spacing treatments. Both the overall F-test (*P* = 0.018) and linear responses (*P* = 0.005) were significant. Error bars are the standard error of the treatment means (S.E.M.)

The observed average seed size was 396 g/1000 seeds, considerably smaller than the typical value of 495 g/1000 seeds for Snowbird faba beans (2018 Saskatchewan Seed Guide). The small seeds can be explained by the dry conditions, especially late in the season during the pod filling stage. With no significant F-test (*P* = 0.696) or orthogonal contrasts (*P* =0.889-0.929), there was no evidence that row spacing affected seed size (Fig. 8). The actual observed values ranged from 394-397 g/1000 seeds but there were no trends whatsoever to suggest either an increase or decrease in seed size with row spacing.

In contrast, the F-test for seed rate was highly significant (*P* < 0.001) and the orthogonal contrasts indicated a clear linear reduction in seed size as the seed rate was increased (*P* < 0.001; Fig. 9). Despite the lack of a quadratic response (*P* = 0.215), the difference in seed size between the 25 and 45 seeds/m^2 treatments (8.3 g/1000 seeds) was somewhat greater than that between the 45 and 65 seeds/m^2 treatments (2.2 g/1000 seeds). Although seed size is a key yield component and, as such, large seeds are desirable, the observed result was presumably a consequence the plants doing their best to compensate for sub-optimal plant populations. Faba bean yield is a function of multiple components including the number of plants per unit area, pods per plant, seeds per pod and, finally, seed size.

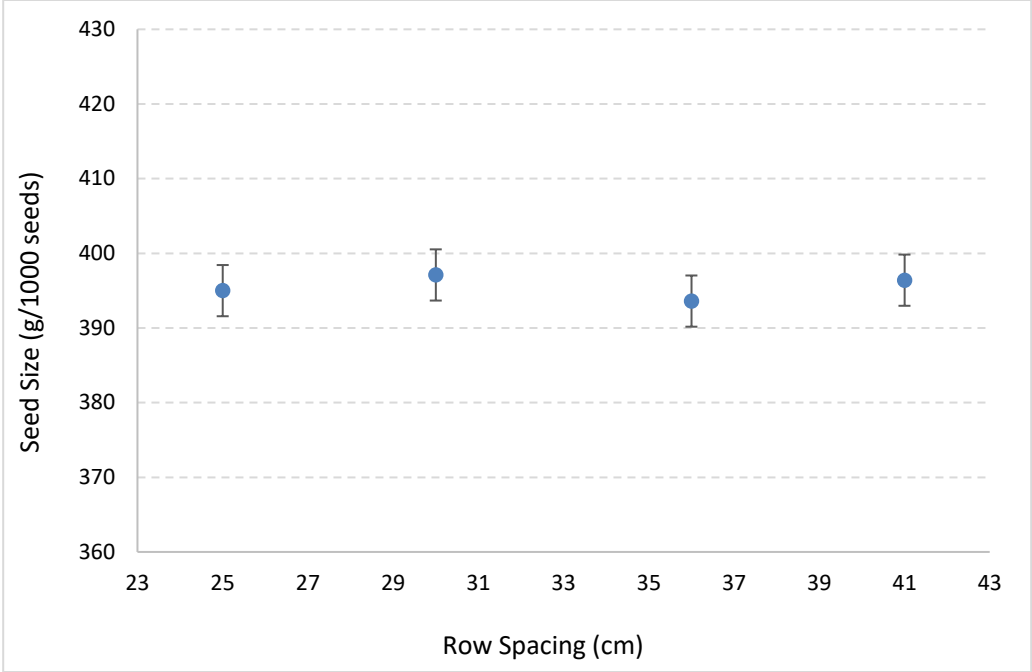

Figure 8. Row spacing effects on faba bean seed size when averaged across seeding rates. Neither the overall F-test (*P* = 0.696) or any orthogonal contrasts (*P* = 0.889-0.929) were significant were significant. Error bars are the standard error of the treatment means (S.E.M.)

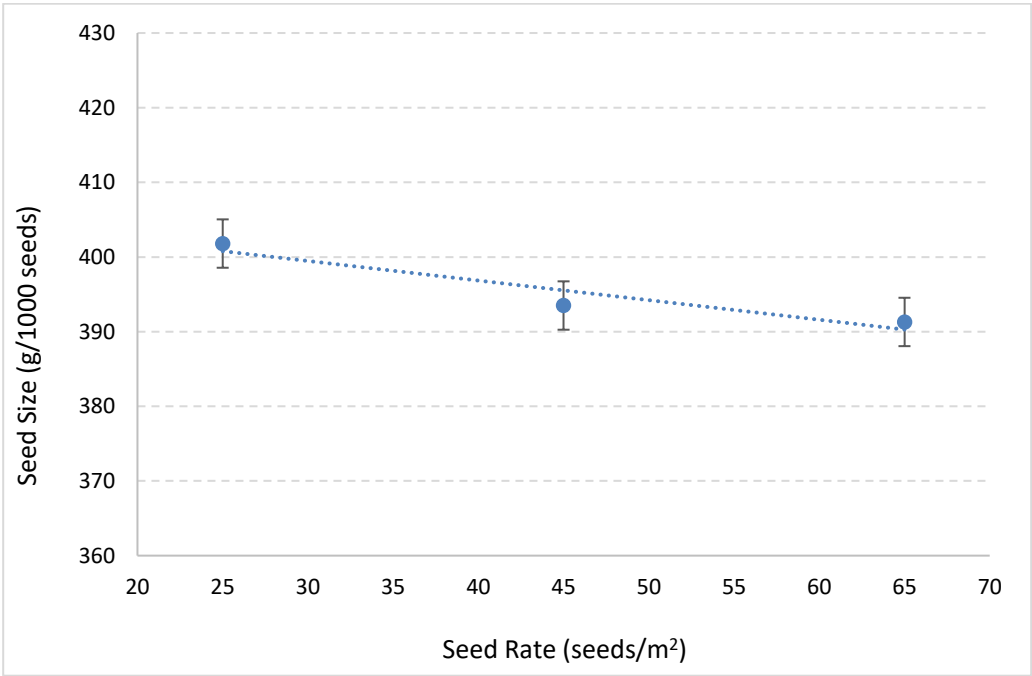

Figure 9. Seed rate effects on faba bean seed size when averaged across seeding rates. Both the overall F-test (*P* = 0.001) and linear responses (*P* < 0.001) were significant. Error bars are the standard error of the treatment means (S.E.M.)

Extension Activities and Dissemination of Results

This project was discussed and the plots were toured by approximately 200 guests at the Indian Head Crop Management Field Day on July 17, 2018. In addition to introducing the project and discussing the specific objectives there was a broader discussion of both general faba bean agronomy and past row spacing research with other crop types. The full project report will be made available online on the IHARF website (www.iharf.ca) and potentially elsewhere in the winter of 2018-19. Results will also be made available through a variety of other media (i.e. oral presentations, popular agriculture press, fact sheets, etc.) as opportunities arise.

Conclusions and Recommendations

Overall the project has demonstrated that, even under drought conditions and with low yield potential, faba beans were relatively insensitive to the range of row spacing levels evaluated (25-41 cm or 10-16"). There was some evidence of reduced seeding mortality at the narrowest spacing but none to suggest that competition with weeds, maturity, or yield were compromised as row spacing was increased. The lack of any observed impact on competition with weeds was may have been due in part to the fact that there were few difficult to kill weed species on the site and conditions were such that excellent control was achieved with the pre-emergent and in-crop herbicide options. In order to increase confidence in the observed results, it would be ideal to repeat this demonstration under more typical conditions when the faba bean yield potential is higher.

Supporting Information

11. Acknowledgements:

This project was supported by the Agricultural Demonstration of Practices and Technologies (ADOPT) initiative under the Canada-Saskatchewan Growing Forward 2 bi-lateral agreement. Crop protection products were provided in-kind by FMC, Bayer CropScience and BASF and the certain design aspects and components of the drill were provided in-kind by SeedMaster. IHARF also has a strong working relationship and memorandum of understanding with Agriculture & Agri-Food Canada.

12. Appendices

Table 5. Main effect means and orthogonal contrast results for row spacing and seed rate effects on faba bean plant density, weed ratings, maturity, seed yield and seed size. Means for each main effect within a column followed by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Main Effect	Plant Density	Weed Rating	Maturity	Seed Yield	Seed Size
Row Spacing	-- plants/m^2 --	------ 0-9 ------	----- days -----	---- kg/ha ----	--- g/1000 ---
25 cm (10")	41.0 a	0.2 a	89.8 a	1989 a	395.0 a
30 cm (12")	35.5 a	0.2 a	90.0 a	1912 a	397.1 a
36 cm (14")	35.5 a	0.3 a	90.0 a	1898 a	393.6 a
41 cm (16")	37.4 a	0.2 a	90.0 a	2025 a	396.4 a
S.E.M.	1.94	0.09	0.20	43.1	3.43
RS-linear	0.196	0.648	0.206	0.582	0.929
RS-quadratic	0.053	0.310	0.225	0.010	0.889
Seed Rate					
25 seeds/m^2	22.7 c	0.6 a	91.5 a	1885 b	401.8 a
45 seeds/m^2	35.8 b	0.0 b	89.7 b	1958 ab	393.5 b
65 seeds/m^2	53.5 a	0.0 b	88.7 c	2024 a	391.3 b
S.E.M.	1.71	0.08	0.19	38.8	3.24
SR-linear	<0.001	<0.001	<0.001	0.005	<0.001
SR-quadratic	0.237	<0.001	<0.001	0.931	0.215

Table 6. Individual treatment means and orthogonal contrast results for row spacing by seed rate effects on faba bean plant density, weed ratings, maturity, seed yield and seed size. Means within a column followed by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$). There were no significant interactions between the two main effects detected.

Interaction	Plant Density	Weed Rating	Maturity	Seed Yield	Seed Size
RS - SR	-- plants/m^2 --	----- 0-9 -----	----- days -----	---- kg/ha ----	--- g/1000 ---
25 cm - 25 seeds/m^2	25.4 def	0.5 b	91.4 a	1896 bcd	400.2 abc
25 cm - 45 seeds/m^2	41.8 b	0.0 c	89.3 cd	1971 abc	392.3 bc
25 cm - 65 seeds/m^2	55.9 a	0.0 c	88.8 de	2101 a	392.4 bc
SR-linear	<0.001	0.017	<0.001	0.033	0.168
SR-quadratic	0.759	0.154	<0.001	0.731	0.409
30 cm - 25 seeds/m^2	22.6 ef	0.5 b	91.5 a	1769 d	404.0 a
30 cm - 45 seeds/m^2	31.4 cde	0.0 c	90.0 b	1900 bcd	395.3 abc
30 cm - 65 seeds/m^2	52.5 a	0.0 c	88.6 e	2067 ab	392.1 bc
SR-linear	<0.001	0.017	<0.001	0.003	0.039
SR-quadratic	0.125	0.154	0.772	0.824	0.565
36 cm - 25 seeds/m^2	20.9 f	1.0 a	91.5 a	1894 bcd	400.7 abc
36 cm - 45 seeds/m^2	33.7 bcd	0.0 c	89.8 bc	1850 cd	390.4 c
36 cm - 65 seeds/m^2	51.8 a	0.0 c	88.8 de	1951 a-d	389.7 c
SR-linear	<0.001	<0.001	<0.001	0.541	0.054
SR-quadratic	0.504	0.006	0.089	0.369	0.318
41 cm - 25 seeds/m^2	22.0 f	0.5 b	91.6 a	1983 abc	402.4 ab
41 cm - 45 seeds/m^2	36.2 bc	0.0 c	89.6 bc	2113 a	396.1 abc
41 cm - 65 seeds/m^2	54.0 a	0.0 c	88.8 de	1979 abc	390.8 c
SR-linear	<0.001	0.017	<0.001	0.968	0.042
SR-quadratic	0.642	0.154	0.013	0.107	0.921
S.E.M.	3.26	0.14	0.24	68.3	4.67

Figure 10. Faba beans seeded at 45 seeds/m^2 and 25 cm (10") row spacing (July 18, 2018).

Figure 11. Faba beans seeded at 45 seeds/m^2 and 30 cm (12") row spacing (July 18, 2018).

Figure 12. Faba beans seeded at 45 seeds/m^2 and 36 cm (14") row spacing (July 18, 2018).

Figure 13. Faba beans seeded at 45 seeds/m^2 and 41 cm (16") row spacing (July 18, 2018).

Abstract

13. Abstract/Summary:

A field trial was established near Indian Head, Saskatchewan to demonstrate faba bean response to row spacing and seeding rate and to assess whether the response to seed rate is affected by row spacing. The treatments, replicated four times, were a combination of four row spacing levels (25, 30, 36, 41 cm) and three seed rates (25, 45, 65 seeds/m^2) and the variables evaluated included plant density, late-season weed pressure, maturity, yield and seed size. The 2018 growing season was, on average, warm and dry with mean temperatures 0.9 °C above average and only 60% of the long-term average precipitation, mostly received in late-May/early-June. There were no interactions between row spacing and seed rate detected. Plant density increased linearly with seeding rate but the effect of row spacing was minor with only subtle evidence of slight higher plant populations at the narrowest spacing. Weeds were controlled well with pre-emergent and in-crop herbicides and there was a slight increase in late-season weed pressure at the lowest seeding rate but no row spacing effect. Maturity was not affected by row spacing but decreased linearly with increasing seed rate. Grain yields were below average overall but similar across row spacing treatments and numerically highest at 41 cm spacing. Yield increased linearly with seed rate but modestly with only a 138 kg/ha (2 bu/ac) difference between the 25-65 seeds/m^2 rates. Seed size was not affected by row spacing but was inversely related to seeding rate with the largest seeds observed at 25 seeds/m^2. In conclusion, this project demonstrated that faba beans performed similarly across the full range of row spacing treatments evaluated but benefited from higher than expected seed rates under drought conditions. It would be beneficial to repeat this work under more typical, higher yielding conditions in order to increase confidence in the results and develop more robust faba bean row spacing recommendations. Approximately 200 guests toured the site at the Indian Head Crop Management Field Day with a discussion on the specific project objectives in addition to general faba bean agronomy and past row spacing work with other crops.
