PROJECT DETAILS

- **Funders:** Alberta Canola and Manitoba Canola Growers
- **Research program:** Canola Agronomic Research Program
- **Principal investigator:** Ken Coles
- **Collaborators/additional investigators:** Lewis Baarda and Michael Gretzinger
- **Year completed:** 2019

Research abstract

Precision planters are recently being adopted for seeding canola in order to improve seedling emergence, stand establishment and yield. To determine the efficiency of precision planters for canola seeding, Farming Smarter conducted field experiments at three locations across southern Alberta from 2016 to 2019 comparing the performance of precision planters (12" and 20" seeding row width) and conventional air drill seeder at five different seeding rates (20, 40, 60, 80 and 160 seed/m^2) for their effect on the emergence, growth and yield of canola. Additionally, optimum rate of in-row liquid phosphorus (P) application to canola during seeding with precision planters and air drill was determined in a separate field experiment at the same locations during 2016-2019. For both field experiments, canola growth, yield and seed quality were estimated using various parameters including crop emergence (%), plant density, canopy closure (determined using normalized difference vegetation index (NDVI) and fractional green canopy cover (FGCC) measurements), plant vigor ratings, seed yield, kernel weight, oil concentration and dockage.

Precision planter with 12" spacing increased seedling emergence and plant stand density compared to the conventional air drill and precision planter (20" spacing) for seeding rates higher than 20 seeds/m^2. Seedling emergence was also observed to be more uniform for the precision planters compared to air drill across both irrigated and rainfed locations. Additionally, the green canopy covering, and plant vigor improved with the precision planter (12") compared to the air drill especially at higher seeding rates (i.e. 80 & 160 seeds/m^2). At seeding rates less than 60 seeds/m^2, crop vigor and canopy covering for air drill were comparable to or higher than the precision planter (12"). Precision planter with 20" spacing, however led to poor crop emergence and canopy covering for all seeding rates compared to both the seeders. The wider 20” rows on the precision planter delay canopy closure. Additionally, more seeds need to be placed in each row, thus leading to higher competition between the plants for resources such as water, sunlight, and nutrients. Consequently, 20" planters led to a significant decrease in yield across all seeding rates. On average, canola yield with 20" planter decreased by 20-28% compared to the conventional air drill. Thus, the adoption of wide row (20") precision planters for the seeding of canola is not recommended.

Narrow (12") planters, on the other hand, led to 2-10% increase in canola yield compared to air drill, with an average increase of 160 kg ha^{-1} across all locations. At the irrigated plot, increase in canola yield with precision planter (12") was even higher, leading to 463 kg ha^{-1} of canola more than the air drill on average. Similarly, 12"

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precision planter led to higher canola yield in years with higher annual precipitation (i.e. 2016 & 2017), while the air drill led to a relatively higher or comparable yield to precision planter (12") in years 2018 and 2019, respectively which had low annual precipitation. Based on these observations, the adoption of narrow precision planters (12") for the seeding of canola is recommended, especially where the conditions are favorable for higher crop growth, such as irrigated fields or high-precipitation areas. Under favorable conditions for crop growth, spatially uniform crop stands established by precise placement of seeds allow for more efficient utilization of resources by individual plants, and less inter-plant competition, thus leading to better crop growth and yield.

This study also tested the application of liquid P within seed rows at different rates while seeding canola with precision planters and air drill. Liquid P application at 60 kg/ha showed some degree of seedling mortality in case of the precision planters (12" and 20"), thus leading to lower plant emergence and canopy covering. However, no such observation of seedling mortality or decrease in plant emergence was made for the lower P application rates between 0 to 40 kg/ha for any of the seeders. For the narrow (12") precision planter, crops were able to recover from the initial losses leading to no substantial difference in yield for different P application rates. However, crop recovery was less effective for the 20" planter, thus leading to a lower yield at 60 kg/ha application rate of liquid P.

Aerial photograph showing canola emergence and plant density for the air drill, and precision planters (12" and 20") for different seeding rates

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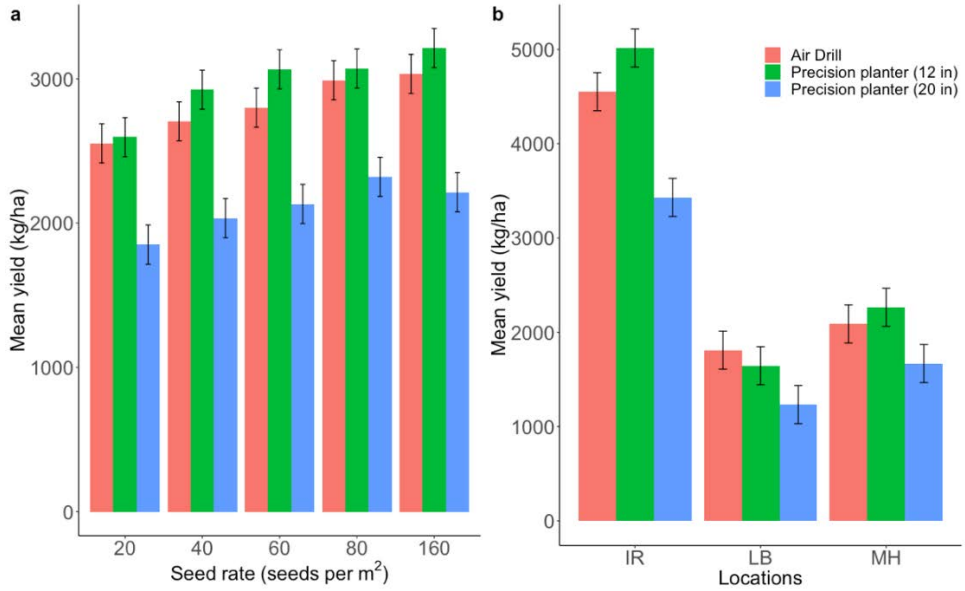

Canola yield for the air drill, precision planter (12") and precision planter (20") at a) different seeding rates and b) different locations (IR - Lethbridge irrigated, LB - Lethbridge dryland, MH - Medicine Hat) averaged across study years 2016-2019

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