

Determining Optimum Target Plant Stands for Spring Cereal Crops in Manitoba

Project duration – 2017-2018

Objectives – To determine optimum plant populations for spring wheat, oat, and barley, and will determine if optimum plant population differs for individual cultivars.

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Results

Mortality

- Seedling mortality averaged 21% across all crop types, locations, and seeding rates, but ranged from 0-51% (data not shown). In general, mortality was higher at higher seeding rates. Figure 2 shows actual plant stand for each crop and location.
- When calculating seeding rates for spring cereals 10-20% stand loss should be taken into account.

Tillering

- Cereals typically compensate for lower plant populations by increasing tillering. Varieties have differing abilities to tiller, but in this study no differences between the wheat and oat varieties were found at any location, only at the Melita site did the barley varieties differ in heads/plant (data not shown).

While the general trend was for heads/plant to decrease as plant population increased (Table 1), statistically significant differences in heads/plant across plant populations were only seen in wheat at the Melita site and in oat at the Arborg site.

Table 1. Heads/plant for spring wheat, oat, and barley at five target plant populations averaged across locations.

Target Plant Population (plants/ft ²)	Heads/Plant		
	Wheat	Oat	Barley
15	2.8	2.0	3.3
21	2.4	1.8	3.0
27	2.2	1.5	2.3
33	2.2	1.8	2.2
39	2.1	1.5	2.3

Yield

- Both cultivars of each crop responded similarly to increasing plant stands; therefore, yield results are averaged over cultivars.
- Plant stand did not have a significant effect on barley yield at the Carberry and Melita locations, but at Arborg the trend was for yield to increase with higher plant stands (Figure 1A).
- Plant stand did not have a significant effect on oat yield at either location (Figure. 1B).
- For wheat, plant stand did not effect yield at the Carberry location but yield did significantly increase with increasing plant stands at Melita (Figure 1C).

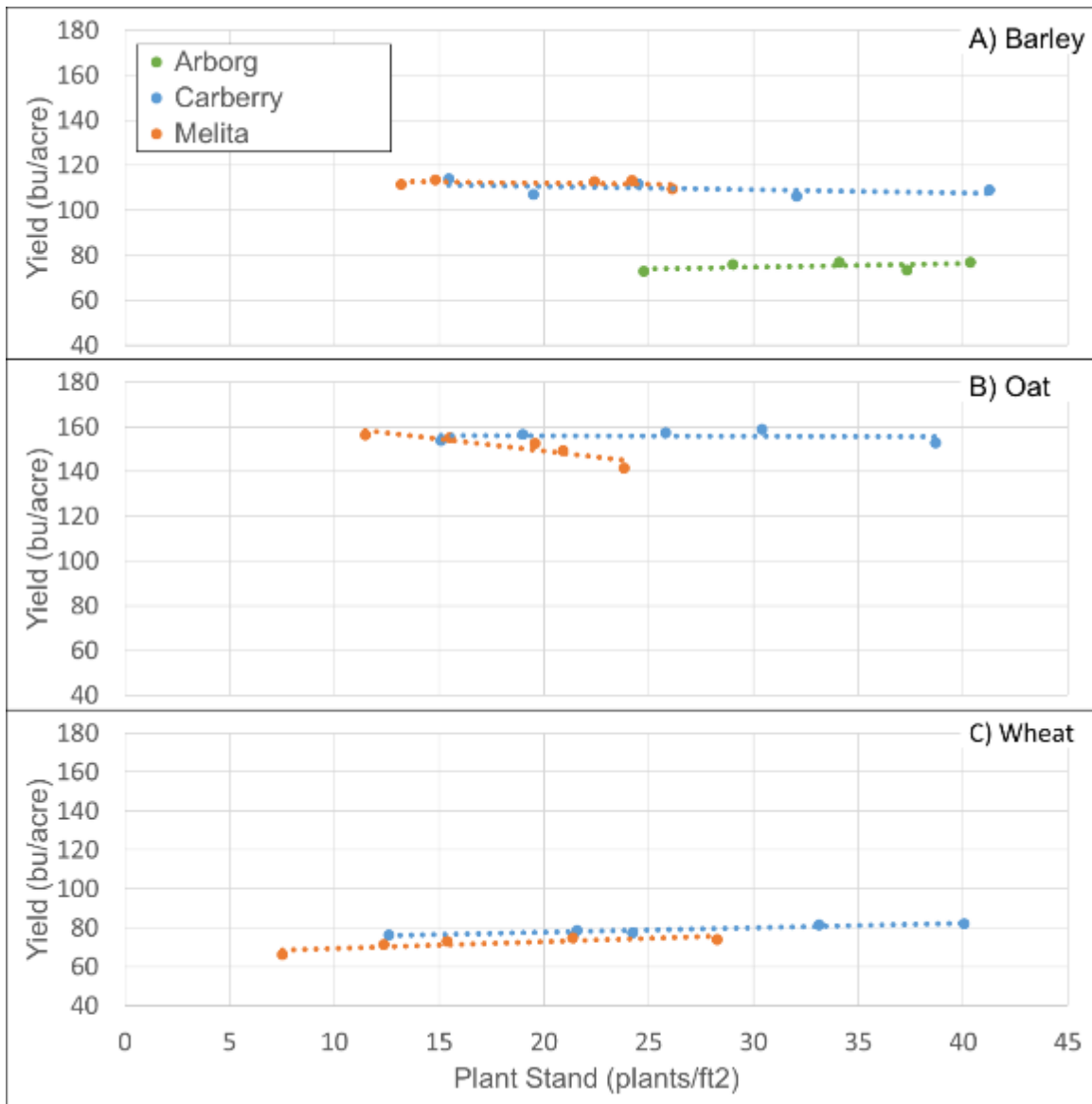


Figure 1. Yield (bu/acre) at five plant stands (plants/ft²) for barley (A), oat (B), and wheat (C), at Arborg (green, barley only), Carberry (blue), and Melita (orange). Yields are represented by circles, linear trend lines are dashed lines. Treatments within the same location with the same letter are not significantly different ($P < 0.05$).

Project findings

Mortality, tillering, and yield are highly influenced by environment; more data is needed to make recommendations about optimal plant stand

Materials & Methods

Experimental Design: Random Complete Block Design
 Entries: 10 entries for each cereal
 Seeding: **Barley:** May 18; **Oats:** May 18; **Wheat:** May 17

Harvest: **Barley:** Sept 1; **Oats** Sept 4; **Wheat:** Sept 1
 Varieties: **Barley:** AAC Synergy and CDC Austenson;
Oat: Summit and CS Camden;
Wheat: Brandon and Prosper

Two cultivars of spring wheat (AAC Brandon and Prosper), oat (CS Camden and Summit), and barley (AAC Synergy and CDC Austenson) were grown at the crop diversification centres in Arborg, Carberry, Melita and Roblin, at five seeding rates. Target plant stands were 15, 21, 27, 33, and 39 plants/ft². Data collected includes plant stand, mortality, heads/plant, and yield. Data from the Roblin location is not included in the results since a range of plant stands was not achieved. A late season hail storm damaged oat and wheat plots in Arborg, yield data from those trials is not included in the results. This project will take place over two growing seasons, data presented is preliminary and from 2017 only.



Figure 2. AAC Synergy barley planted at target plant stands of 15, 27, and 39 plants/ft² (left to right).

Table 1: Target Plant Population

(Plants/m ²)	15	21	27	33	39
Seeds/m ² for target population (+15%)	186	260	334	408	483

Data collected and date collected

Emergence **Barley:** May 27; **Oats:** May 27; **Wheat:** May 27
 Emergence population **Barley:** June 9; **Oats:** June 9; **Wheat:** June 9
 % Seed mortality **Barley:** June 9; **Oats:** June 9; **Wheat:** June 9
 Heading (50%) **Barley:** July 9; **Oats:** July 13; **Wheat:** July 9
 Head counts **Barley:** July 27; **Oats:** July 27; **Wheat:** July 27
 Lodging **Barley:** Sept 1; **Oats** Sept 4; **Wheat:** Sept 1

Agronomic info

Previous year's crop: Oat barley silage

Soil Type: Erickson Loam Clay
 Landscape: Rolling with trees to the east
 Seedbed preparation: Heavy harrowed twice

Table 2: Spring 2017 Soil Test

Available	
N	86 lb/ac
P	10 ppm
K	183 ppm
S	184 lb/ac

Table 3: Added N and P

	Blend	Blend (actual lbs/ac)	Actual lbs N	Actual lbs P
Barley	46-0-0	78.01	38	0
	11-52-0-0	19.23	2.12	10
	Total	-	40.12	10
Oats	46-0-0	28.01	15	1
	11-52-0-0	19.23	2.12	10
	Total	-	17.12	10
Spring Wheat	46-0-0	278.01	130	0
	11-52-0-0	19.23	2.12	10
	Total	-	132.12	10

N side-banded; P Banded with seed

Table 4: Pesticide Application

	Crop stage	Date	Product	Rate
Barley	Pre-emerge	May 18	RoundUp WeatherMax	0.51 L/ac
	In-crop	June 27	Prestige XCA	0.26 L/ac
	In-crop	June 27	Axial BIA	0.96 L/ac
	Desiccation	Aug 24	RoundUp	0.67 L/ac
Oats	Pre-emerge	May 18	RoundUp WeatherMax	0.51 L/ac
	In-crop	June 12	Prestige XCA	0.17 L/ac
	Desiccation	Aug 24	RoundUp	0.67 L/ac
Spring Wheat	Pre-emerge	May 18	RoundUp WeatherMax	0.51 L/ac
	In-crop	June 27	Prestige XCA	0.26 L/ac
	In-crop	June 27	Axial BIA	0.96 L/ac
	Desiccation	Aug 24	RoundUp	0.67 L/ac