2017 Industrial Hemp Experiment

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BRETON PLOTS 1929 - present

Hemp Production Permits in Canada, 1998 - 2016

Year	BC	AB	Sask.	Man.	Ont	Que	NB	NS	PEI	Yukon	Canada
1998	178	94	650	1,497	2,873	59	529	47	0	0	5,927
1999	556	1,862	7,640	21,950	2,523	212	10	312	10	0	35,075
2000	719	756	3,522	7,179	535	590	2	252	4	0	13,559
2001	237	279	968	1,165	516	74	0	0	0	10	3,239
2002	495	304	1,110	1,474	351	47	0	0	0	0	3,781
2003	18	379	1,661	3,625	981	32	10	44	0	0	6,750
2004	44	1,577	2,480	4,089	451	26	10	44	0	0	8,721
2005	0	2,263	8,469	12,395	620	182	47	44	0	0	24,021
2006	273	5,194	14,882	26,442	982	224	20	44	0	0	48,060
2007	173	3,593	5,663	5,157	99	450	10	0	0	0	15,145
2008	12	1,437	3,798	2,453	20	331	0	0	0	0	8,050
2009	207	1,932	5,091	6,014	326	227	0	0	40	0	13,837
2010	158	5,152	10,409	9,384	919	793	0	0	0	0	26,815
2011	20	15,892	9,944	11,352	874	716	0	0	10	0	38,808
2012	40	13,494	24,720	15,716	1020	1579	0	0	0	0	56,569
2013	119	15,766	33,183	14,592	153.4	1095.4	0	0	34.6	0	64,943
2014	43	25,557	53,397	27,310	871.2	1315.7	0	0	12.4	0	108,505
2015	177	24,561	37,894	19,964	702	1,252	17	86	10	-	84,662
2016	867	31969	21082	18034	1896	2148	40	227	75		76,338

Table provided by Alberta Agriculture and Forestry, Bio-Industrial Opportunities Section

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Industrial Hemp ENTERPRISE. Agdex 153/830-1

Table 1. **Industrial Hemp Varieties Cultivated in 2014 in Canada**

Variety	Alberta		Other Provinces		Total	
	hectares (ha)	acres (ac)	hectares (ha)	acres (ac)	hectares (ha)	acres (ac)
Finola	7,402.5	18,292	6,263.97	15,479	13,666.47	33,771
CFX-2	1,394.37	3,446	10,142.05	25,062	11,536.42	28,505
X-59	1,470.75	3,634	6,455.92	15,953	7,926.67	19,587
CRS-1	65	161	6,262.26	15,474	6,327.26	15,635
CFX-1			1,253.89	3,098	1,253.89	3,098
Canda			1,150.75	2,844	1,150.75	2,844
Delores			1,017.21	2,514	1,017.21	2,514
CanMa			274.72	679	274.72	679
Anka			263.83	652	263.83	652
Ferimon			215.29	532	215.29	532
USO 31			108.07	267	108.07	267
Alyssa			74.98	185	74.98	185
USO 14			59.88	148	59.88	148
Joey			8	20	8	20
Carmen			4.05	10	4.05	10
Other	10	24.7	11.04	27	11.04	27
Total	**10,342.62**	**25,557**	**33,565.91**	**82,943**	**43,908.53**	**108,500**

EXPERIMENTAL DESIGN

- Small plot experiment; randomized complete block design with 4 replications
- Two methods of seeding: drilled verses broadcast + incorporate
- Several varieties; number to be based on seed availability
- Trial to be located at the University of Alberta Breton Plots, at the east end of Brazeau County, with a second site managed by West Central “across the river”.

VARIETIES

Parkland Industrial Hemp Growers (Triple S Seeds)

1. Delores – Monoecious; 157 cm mature height.
2. Canda - Monoecious; 140 cm mature height
3. Joey – Monoecious; 151 cm mature height

Hemp Oil Canada (Mercer Seeds)

4. Finola – Dioecious; short stature, moderate maturing (~100 days).

TerraMax

5. Hempnut (X59) - Dioecious; moderate height and maturity

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PLOT PLAN

(revised from original)

Plot #	101	102	103	104	105	106	107	108
Tmt	8	3	1	5	5 repeat	4	2	6
Variety	Finola	Canda	Delores	Joey	Joey	Canda	Delores	Joey
Placement	Row Seeded	Broadcast	Broadcast	Broadcast	Broadcast	Row Seeded	Row Seeded	Row Seeded
Plot #	201	202	203	204	205	206	207	208
Tmt	10	5	3	1	1 repeat	5	3	2
Variety	X59	Joey	Canda	Delores	Delores	Canda	Joey	Delores
Placement	Row Seeded	Broadcast	Broadcast	Broadcast	Broadcast	Row Seeded	Broadcast	Row Seeded
Plot #	301	302	303	304	305	306	307	308
Tmt	7	3 repeat	5	1	3	2	5	2
Variety	Finola	Canda	Joey	Delores	Canda	Delores	Joey	Canda
Placement	Broadcast	Broadcast	Broadcast	Broadcast	Broadcast	Row Seeded	Broadcast	Row Seeded
Plot #	401	402	403	404	405	406	407	408
Tmt	4	3	1 repeat	1	3	5	6	2
Variety	Canda	Canda	Delores	Delores	Canda	Joey	Joey	Delores
Placement	Row Seeded	Broadcast	Broadcast	Broadcast	Broadcast	Broadcast	Row Seeded	Row Seeded

SEEDING

JUNE 8, 2017

- Area was broke from alfalfa/timothy in 2016.
- Plots rotary tilled prior to seeding.
- Seeded using “Green Machine” plot seeder.
  - Double disc openers at 9” row spacing.
- Seeding rate: 28 kg/ha.
- Seeds were either broadcast and incorporated using tiller
- or seeded to 1” depth.

Growing season management

- Industrial hemp was grown using an organic production system, without the use of fertilizer or pesticides.
- Because of forage plow-down in previous year, it was hypothesized that soil mineralization of organic matter would provide sufficient nutrients to sustain plant growth.
- Plant density would be evaluated towards assessing the competitive nature of the crop for weed suppression.
- Harvesting will be completed on three dates: early, mid and late season.

PLANT DENSITY

Broadcast - incorporated

Seedrow

Recommended practice:
Seed: 100 – 120 plants/m2
Fibre: 300 – 375 plants/m2

PLANT DENSITY

July 8, 2017 – 30 days after seeding

Variety Name	Seeding Method	TKW (g)	Seeding rate (kg/ha)	Approx.[1] seeds/m2	Average[2] plants/m2
Delores	Broadcast, Incorporate	18.2	28	335	136
Delores	Row Seeded	18.2	28	335	78
Canda	Broadcast, Incorporate	19.5	28	312	151
Canda	Row Seeded	19.5	28	312	170
Joey	Broadcast, Incorporate	18.3	28	333	158
Joey	Row Seeded	18.3	28	333	247
Finola	Broadcast, Incorporate	13.1	28	465	297
Finola	Row Seeded	13.1	28	465	362
X59	Broadcast, Incorporate	17.2	28	354	-
X59	Row Seeded	17.2	28	354	160

[1]Calculated based on thousand kernel weight (TKW), seeding rate and area.
[2]Determined by counting the number of plants within a square meter area.

PLANT HEIGHT

(at maturity)

Plot #	101	102	103	104	105	106	107	108
Tmt	8	3	1	5	5 repeat	4	2	6
Variety	Finola	Canda	Delores	Joey	Joey	Canda	Delores	Joey
Placement	Row Seeded	Broadcast	Broadcast	Broadcast	Broadcast	Row Seeded	Row Seeded	Row Seeded
Plant 1 (cm)	**100**	**180**	**205**	**205**	**180**	**165**	**165**	**120**
Plant 2 (cm)	**115**	**220**	**210**	**195**	**155**	**170**	**165**	**150**

Plot #	301	302	303	304	305	306	307	308
Tmt	7	3 repeat	5	1	3	2	5	2
Variety	Finola	Canda	Joey	Delores	Canda	Delores	Joey	Canda
Placement	Broadcast	Broadcast	Broadcast	Broadcast	Broadcast	Row Seeded	Broadcast	Row Seeded
Plant 1 (cm)	**130**	**230**	**240**	**240**	**180**	**260**	**170**	**120**
Plant 2 (cm)	**115**	**210**	**195**	**205**	**210**	**210**	**150**	**150**

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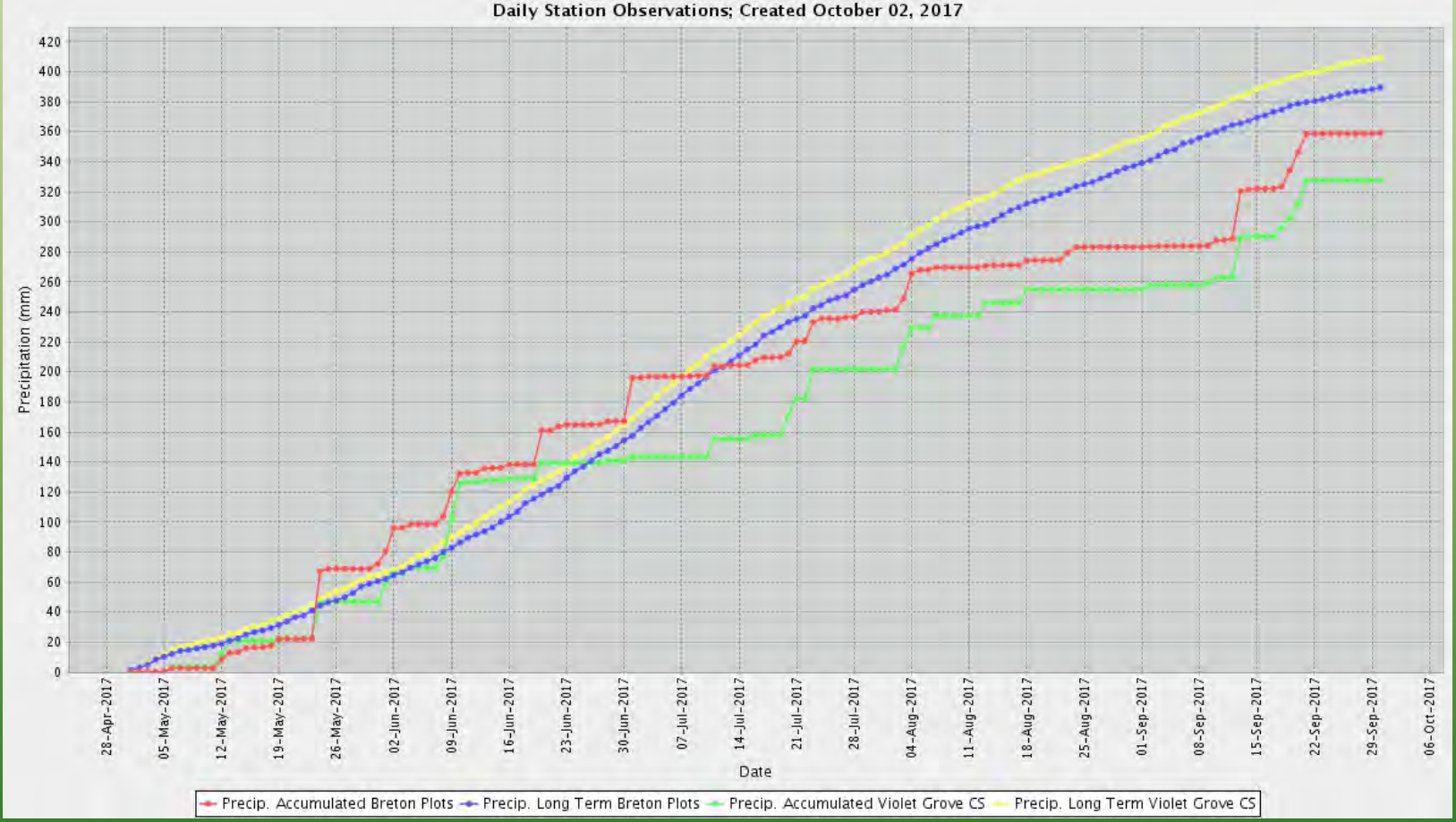
PRECIPITATION



- More precipitation at Breton Plots than west of Drayton Valley at Violet Grove.
- Breton Plots did not receive any hail.

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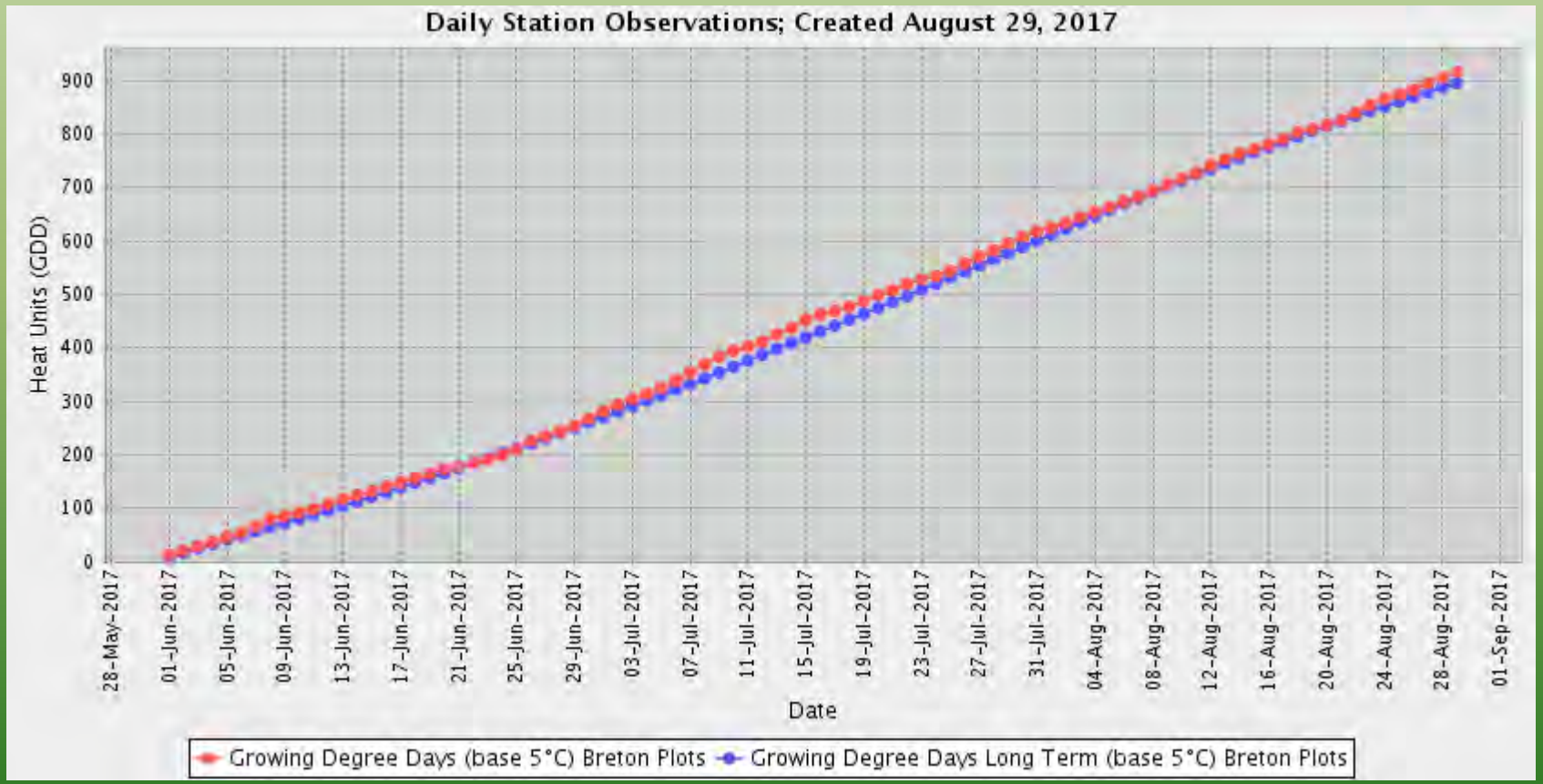
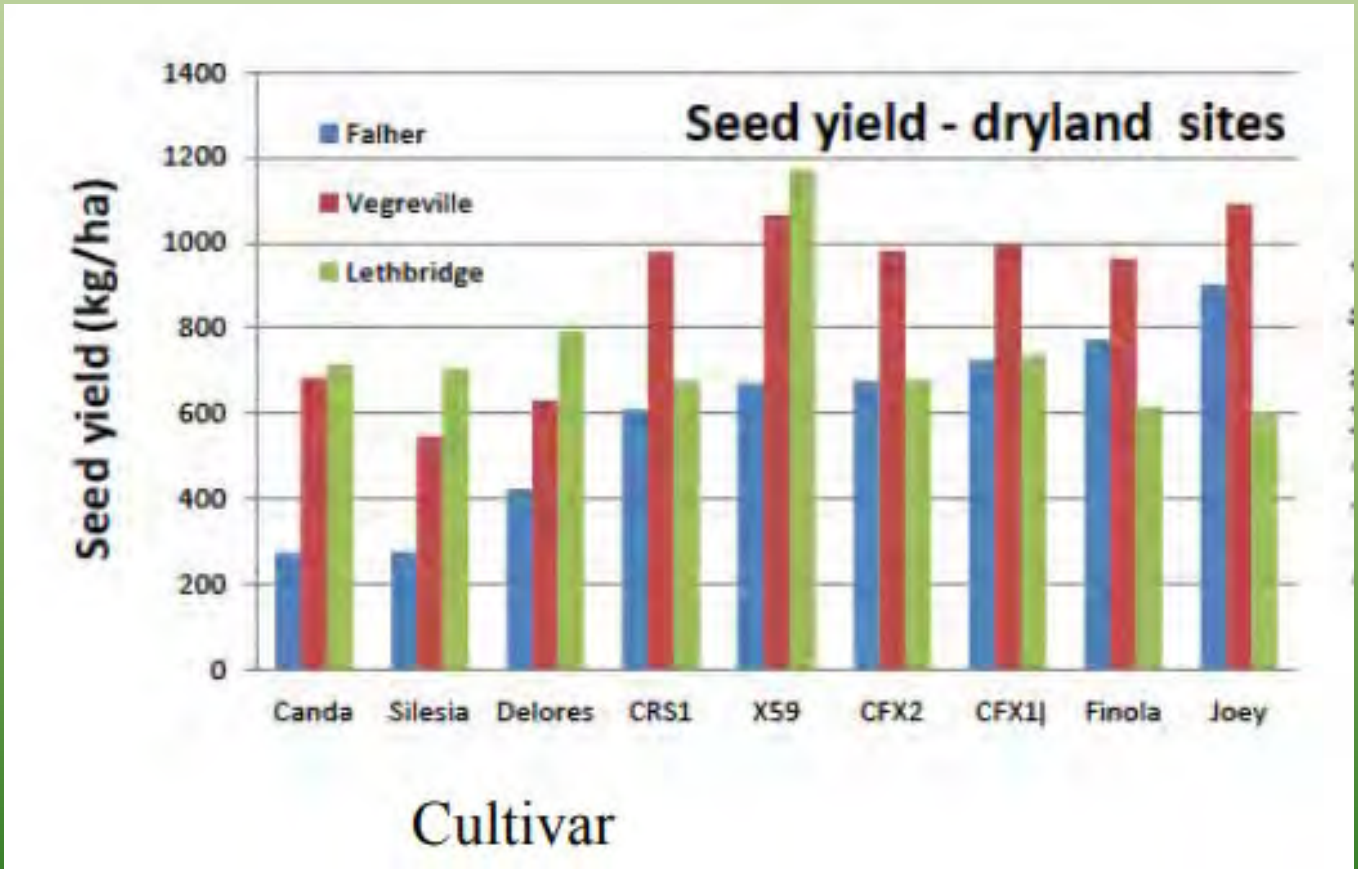
GROWING DEGREE DAYS



Growing degree days at the Breton Plots, 2017 were near normal.

SEED YIELDS – Past data



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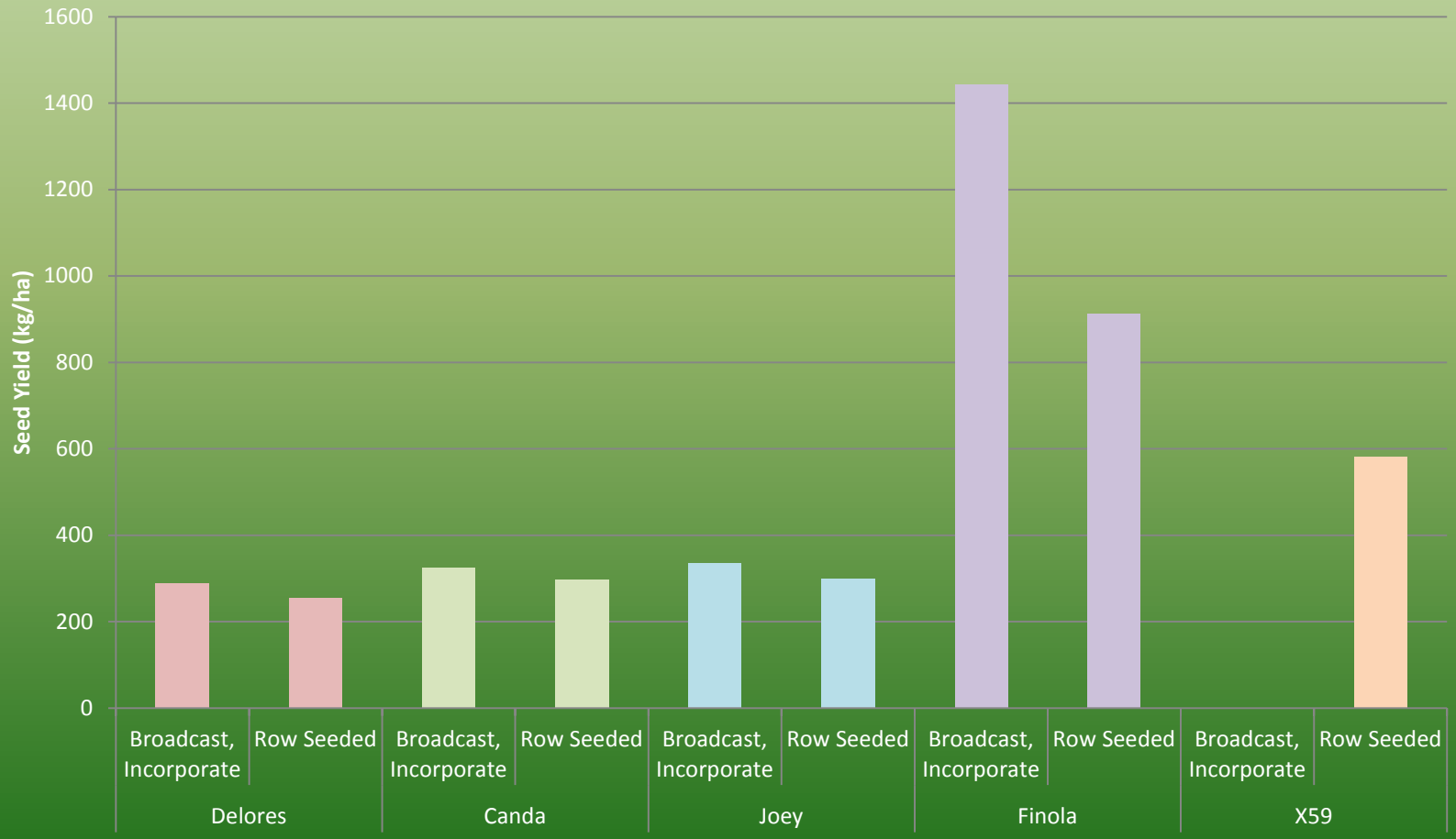
Yield Determination

- Plants were cut using a hand sickle from within a square meter area.
- Samples were bagged and oven dried at 65^{o}C until uniform moisture was achieved.
- After weighing, samples were threshed by hand to remove seed.
- Grain sample was sieved/cleaned using a Clipper^{tm} seed cleaner to remove immature seeds and chaff.

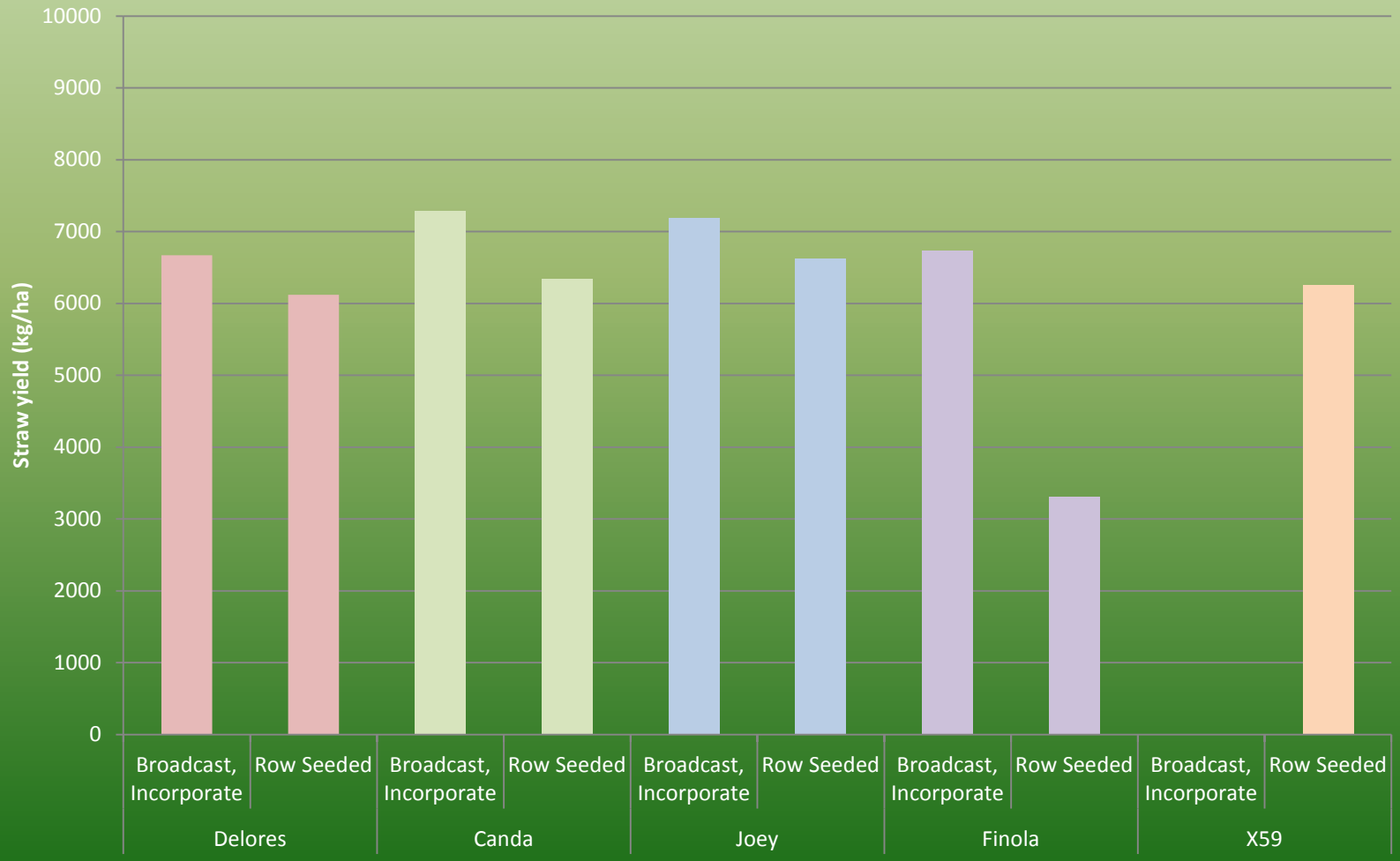
SEED YIELD (early) – Breton Plots

August 31, 2017 – 84 days after seeding



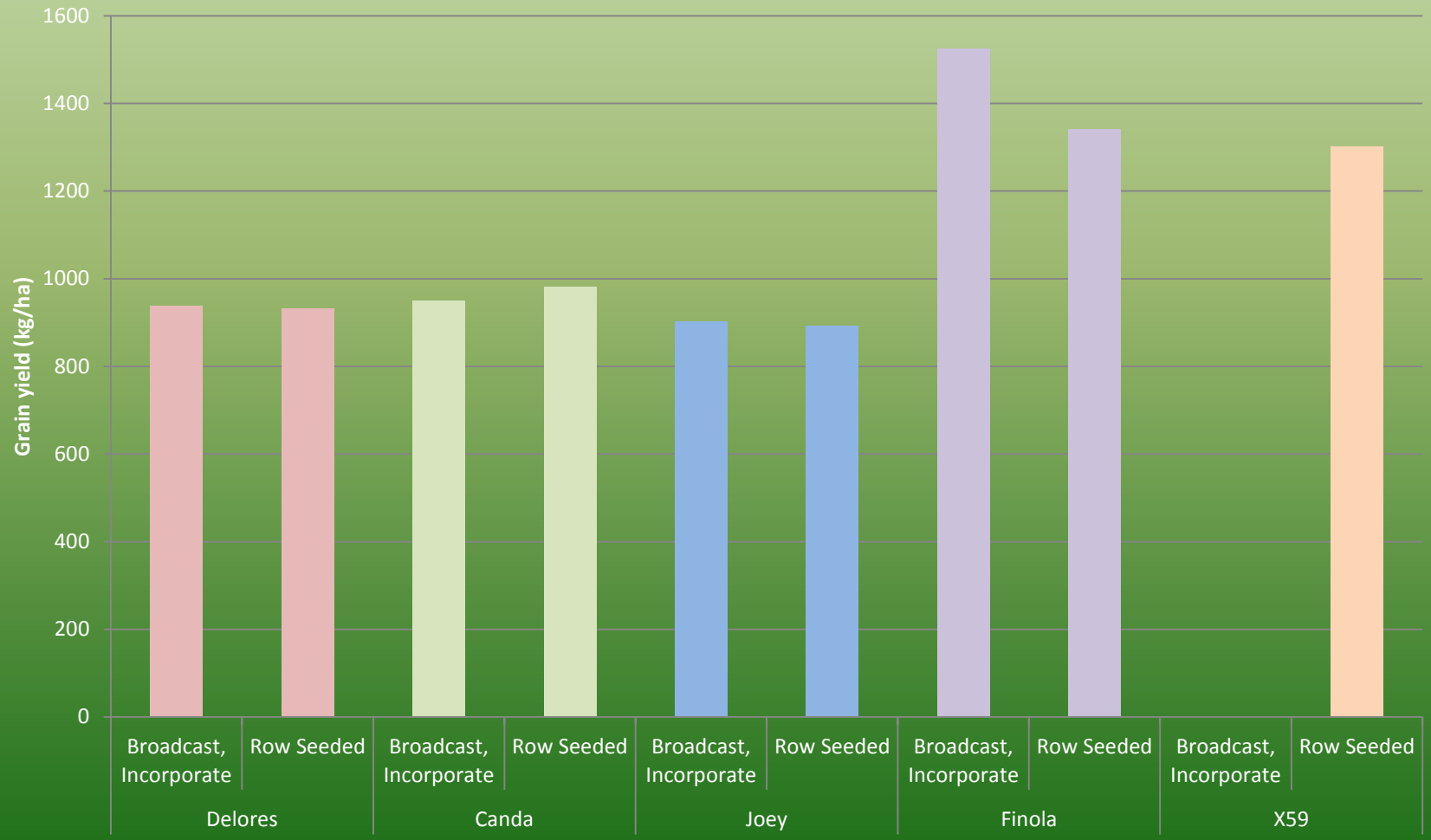
STRAW YIELD (early) –Breton Plots

August 31, 2017 – 84 days after seeding



SEED YIELD (mid) – Breton Plots

September 18, 2017 – 102 days after seeding



STRAW YIELD (mid) – Breton Plots

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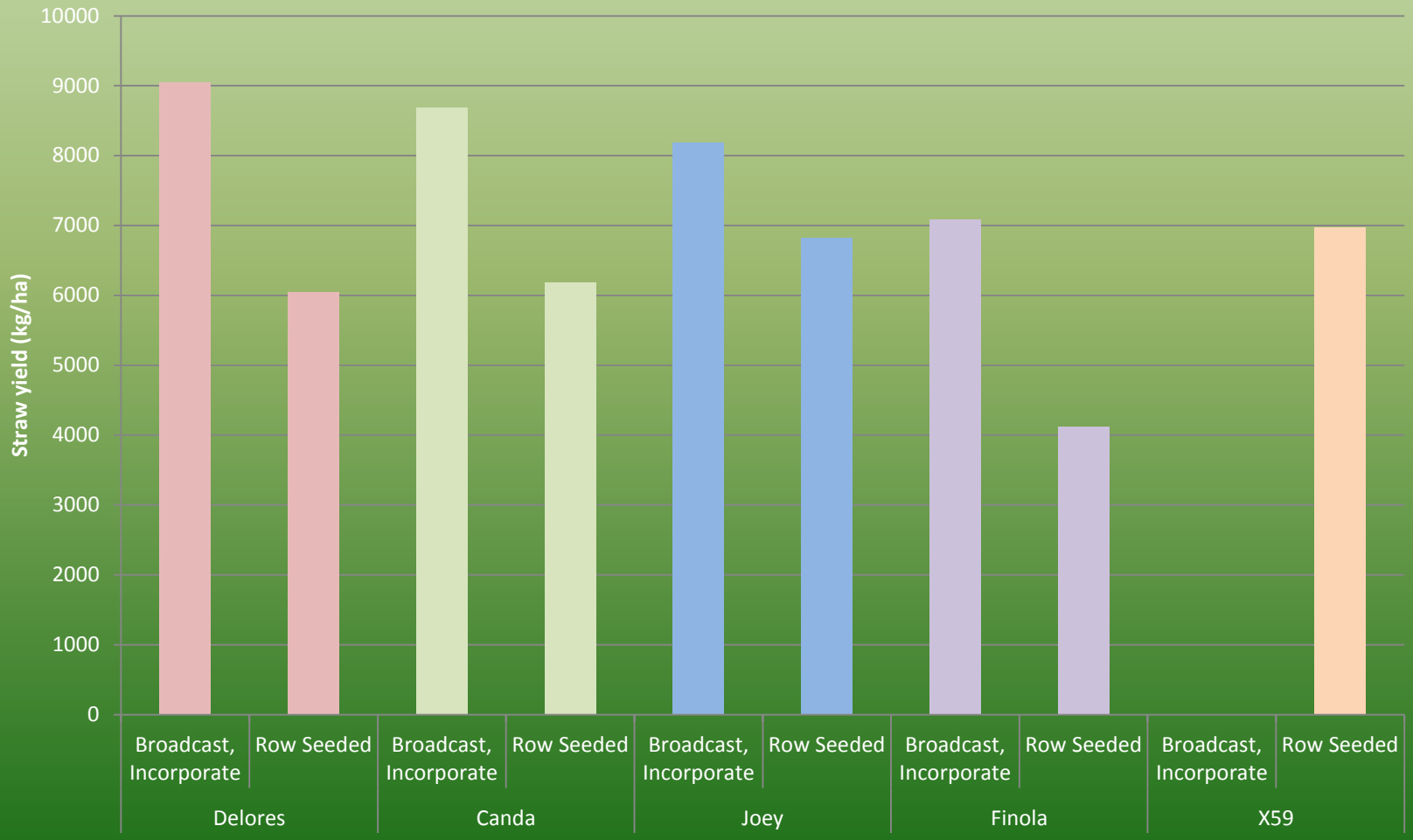
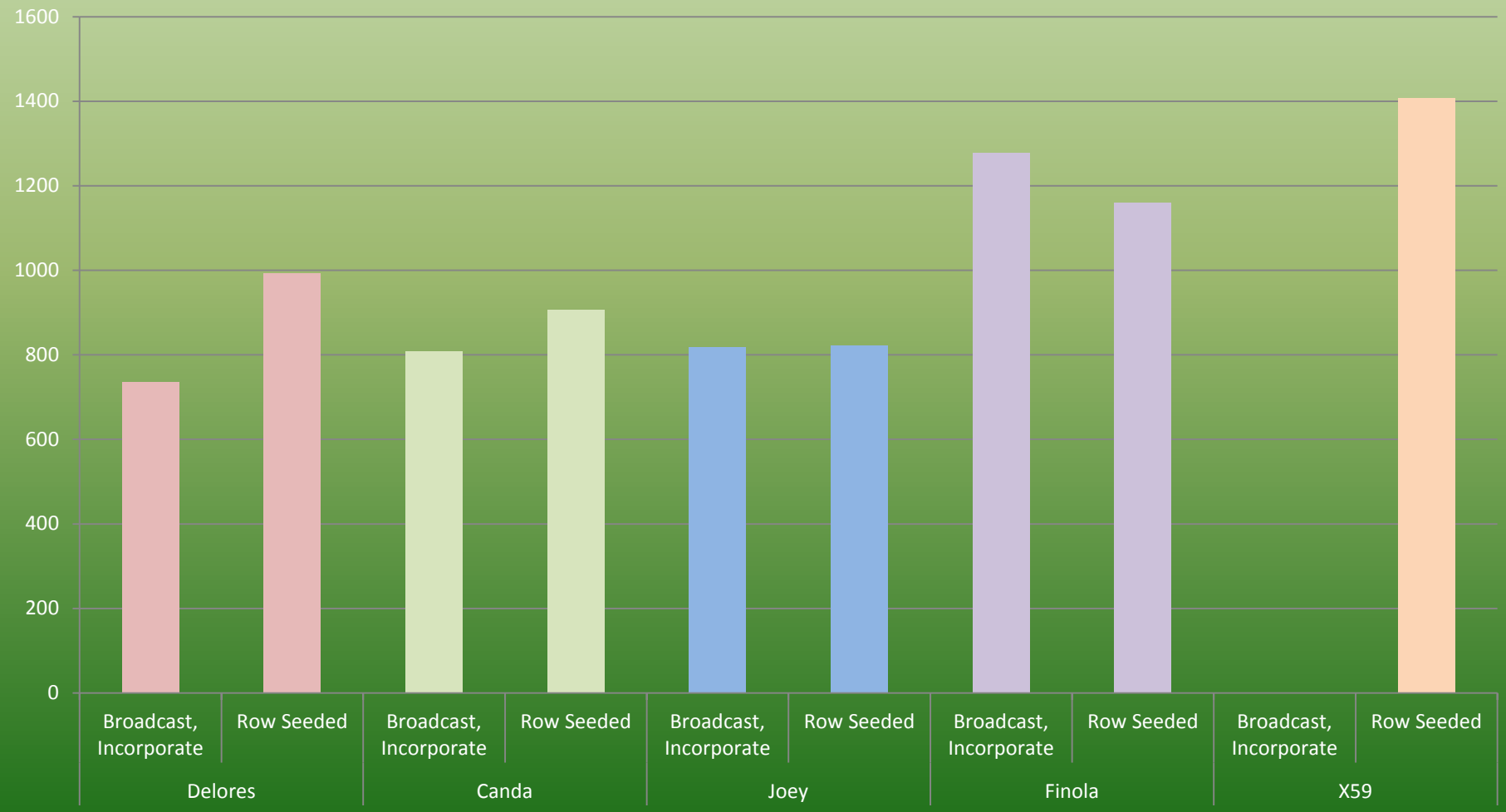


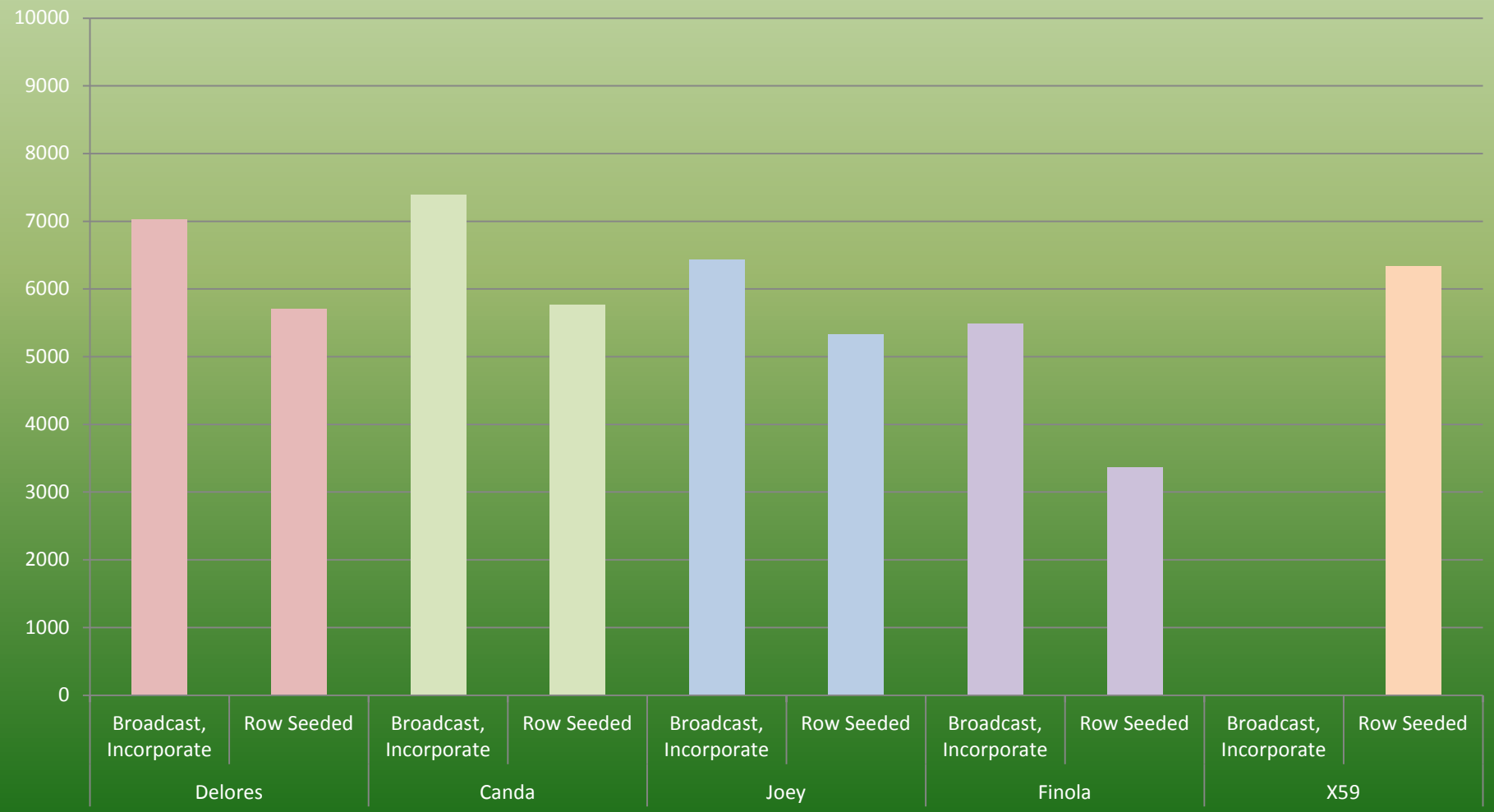
SEED YIELD (late) – Breton Plots

October 6, 2017 – 120 days after seeding

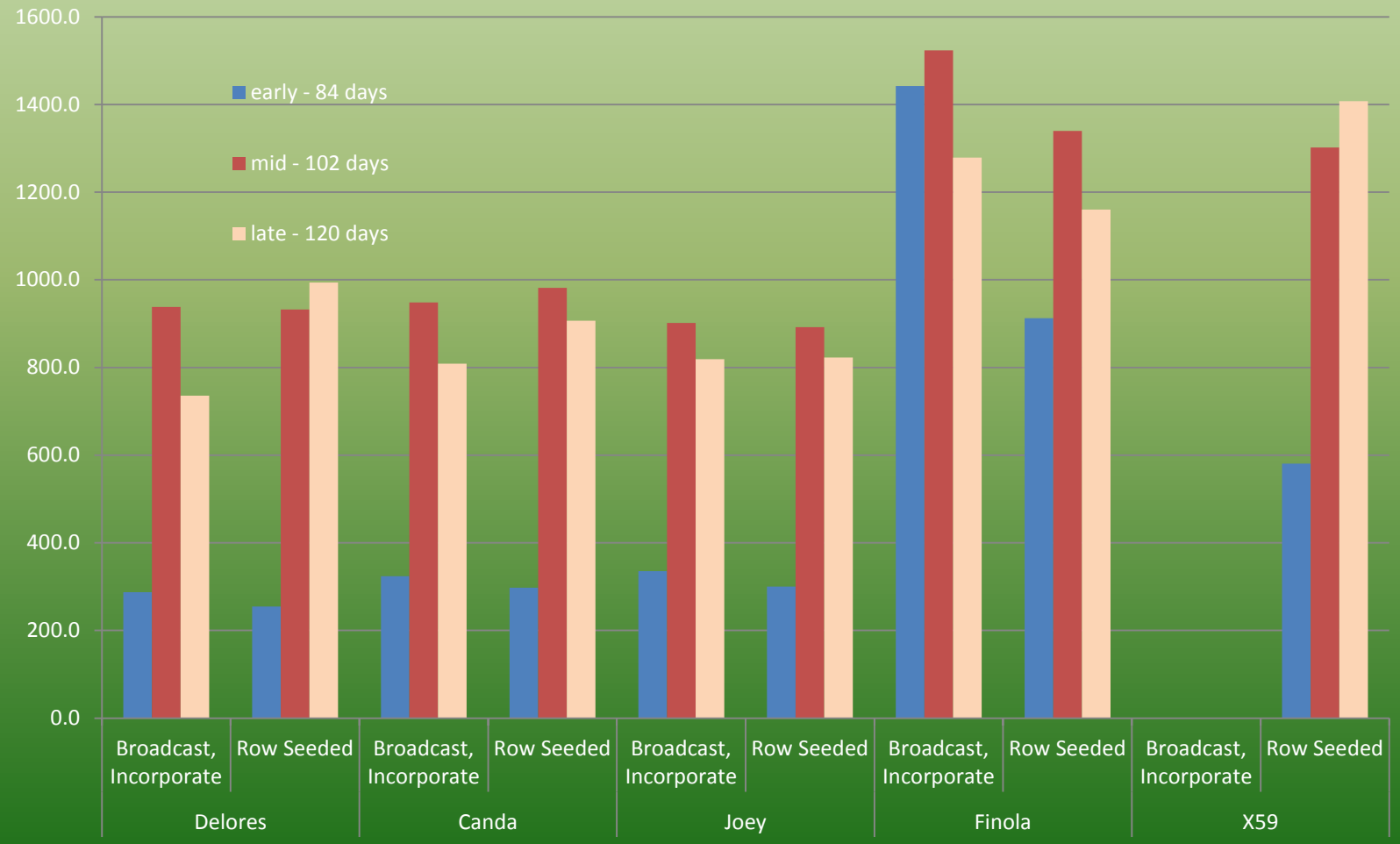


STRAW YIELD (late) – Breton Plots

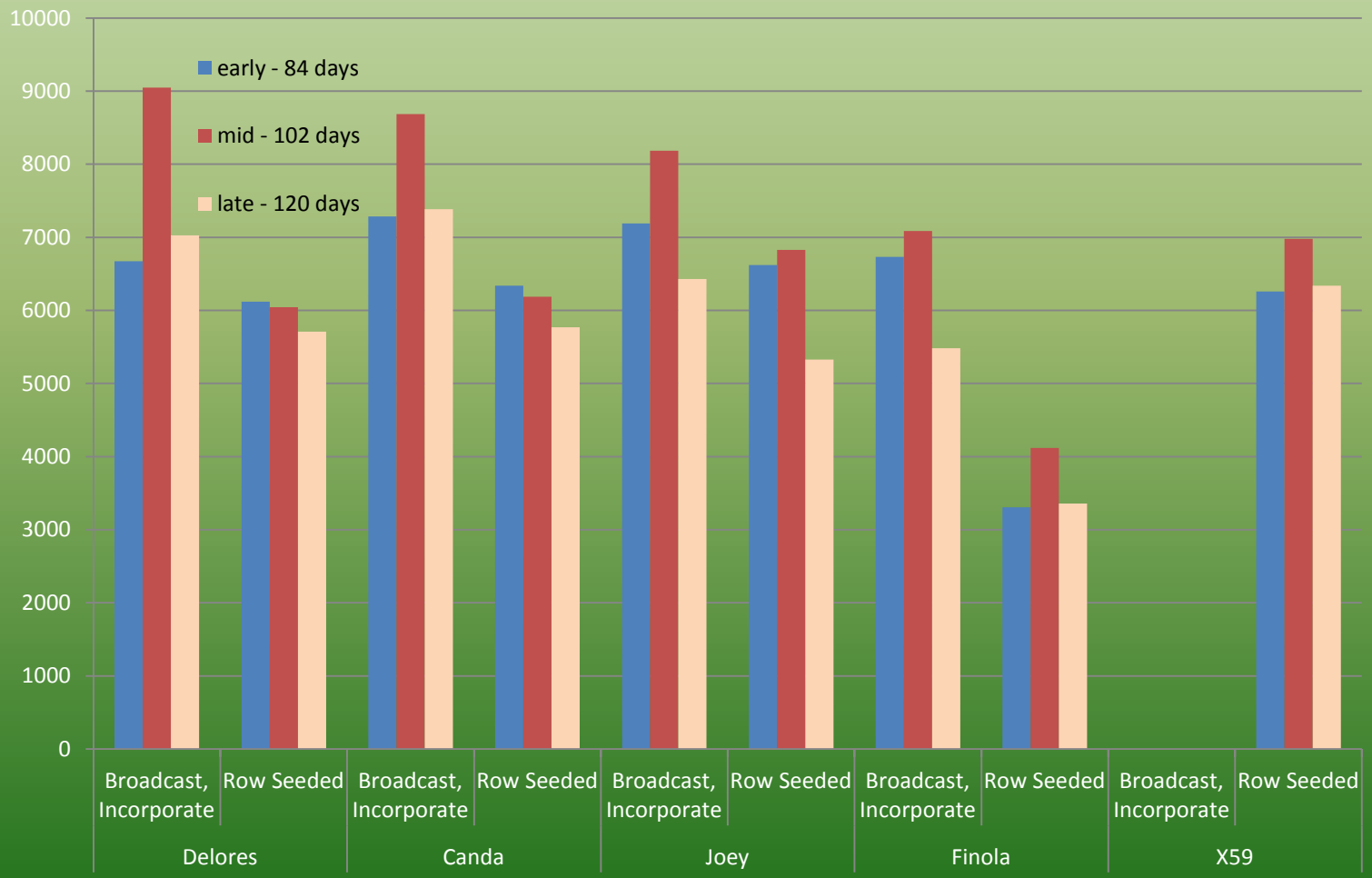
October 6, 2017 – 120 days after seeding



SEED YIELD (all) – Breton Plots



STRAW YIELD (all) – Breton Plots



SEED YIELD

Other considerations

American Goldfinch

SEED YIELD

Other considerations

Snowfall October 1, 2017

Results

- Statistical analysis of data was not completed because of the unbalanced number of replications for each treatment (errors made at time of seeding).
- Despite higher growing season precipitation at the Breton Plots than at Violet Grove, success of growth at this site verses other sites in Brazeau County can be attributed to seeding date, good drainage and good soil fertility from forage plow-down.
- Weed control was not required, partly because of the absence of weeds after forage plow-down, and also because of the competitive and fast growing nature of industrial hemp after emergence.
- For the early harvest date, the early maturing variety Finola was by far the highest yielding, with yields exceeding 1400 kg/ha. The later maturing varieties only yielded around 200 kg/ha.

Results

- For the early harvest date, all varieties tested had straw yields greater than 6000 kg/ha. Canda and Joey had the highest straw yields, exceeding 7000 kg/ha.
- For the mid harvest date (102 days after seeding), Finola and X59 had the highest grain yields of between 1300 – 1500 kg/ha. Delores, Canda and Joey were very similar in grain yield of 900 kg/ha.
- For straw yield at the mid harvest date, Delores, Canda and Joey all exceeded 8000 kg/ha, with Finola and X59 yielding around 7000 kg/ha.
- Between the mid and late harvesting date, an early snowfall caused the taller varieties to lean and bend over.
- For grain yield at the late harvest date (120 days after seeding) X59 and Finola (1400 and 1200 kg/ha respectively) outyielded Delores, Canda and Joey (around 800 kg/ha).
- For straw yield at the late harvest date, Canda, Delores and Joey had reduced yields of around 7000 kg/ha, while X59 and Finola dropped to around 6000 kg/ha.

Conclusions

- High yielding industrial hemp can be successfully grown in Brazeau County.
- When comparing seeding methods, broadcast/incorporated generally yielded higher than row seeded to 1”. Therefore, seeding depth is an important consideration towards maximizing productivity.
- Of the five varieties grown, Finola and X59 produced higher grain yields than Delores, Canda and Joey. However, these later three varieties generally had higher straw yields.
- For harvesting date, maximum yields were achieved for all varieties at 100 days. Snowfall before the late harvest date likely increased seed losses, causing yield reductions.

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MANY THANKS TO:

Brazeau County

TerraMax

PARKLAND
INDUSTRIAL HEMP GROWERS
Co-op Limited

...and our summer helpers...
Billy Johnston-Gramlich
Jefferson Sawyer
Kean Gao
Tina Pultz

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BRETON PLOTS 1929 - present

The new tree of Brazeau County??

July 4, 2017. Canopy closure means fewer weeds.


Industrial Hemp Trial
Plot #: 101
Variety: Finola
Tmt: Seed

Bird’s eye view of industrial hemp plots with early harvest square meter sample removed.

Is hemp competitive?

Grass/weeds grew right up to the edge of the industrial hemp plot, but the area within was free of all grass/weeds.

Soil Health

Large root ball contained numerous earth worms.


August 18, 2017. Industrial hemp plots at the Breton Plots.

September 18, 2017. Yield samples in cloth bags.

August 18, 2017. Considerable height differences between varieties.

August 18, 2017. Tallest crop grown at the Breton Plots; height exceeded 2.5 meters.

September 18, 2017. American goldfinch feeding on industrial hemp.