

Enhancing Flax Productivity

Local Agronomy Research & Demonstration

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Indian Head Agricultural Research Foundation



Management Factors to Consider

Site / Field Selection?

Variety?

Seeding Date?

Seeding Rate?

Row Spacing?

Seed Treatments?

Fertilizer Rates / Placement?

Weed Control?

Foliar Fungicide?

Flax in Rotation with Other Crops



TABLE 1

The effects of preceding crop on the yield of flax at Melfort, Saskatchewan for the period 1994-1997

Preceding Crop	Yield Index (% of spring wheat)
Spring wheat	100
Canola	88
Field pea	103

A.M. Johnston

TABLE 2

The effects of preceding crops on the yield of spring wheat for the period 1982-1993 in Manitoba.

Preceding Crop	Yield Index (% of spring wheat)
Flax	116
Field pea	111
Spring wheat	100
Canola	108

Bourgeois and Entz. 1996. Can. J. Plant Sci. 76:457-459.

- Flax should typically be planted on cereal stubble but may also do well following pulse crops – Avoid planting flax on canola or mustard stubble
- Many crops, including canola, perform well planted on flax stubble

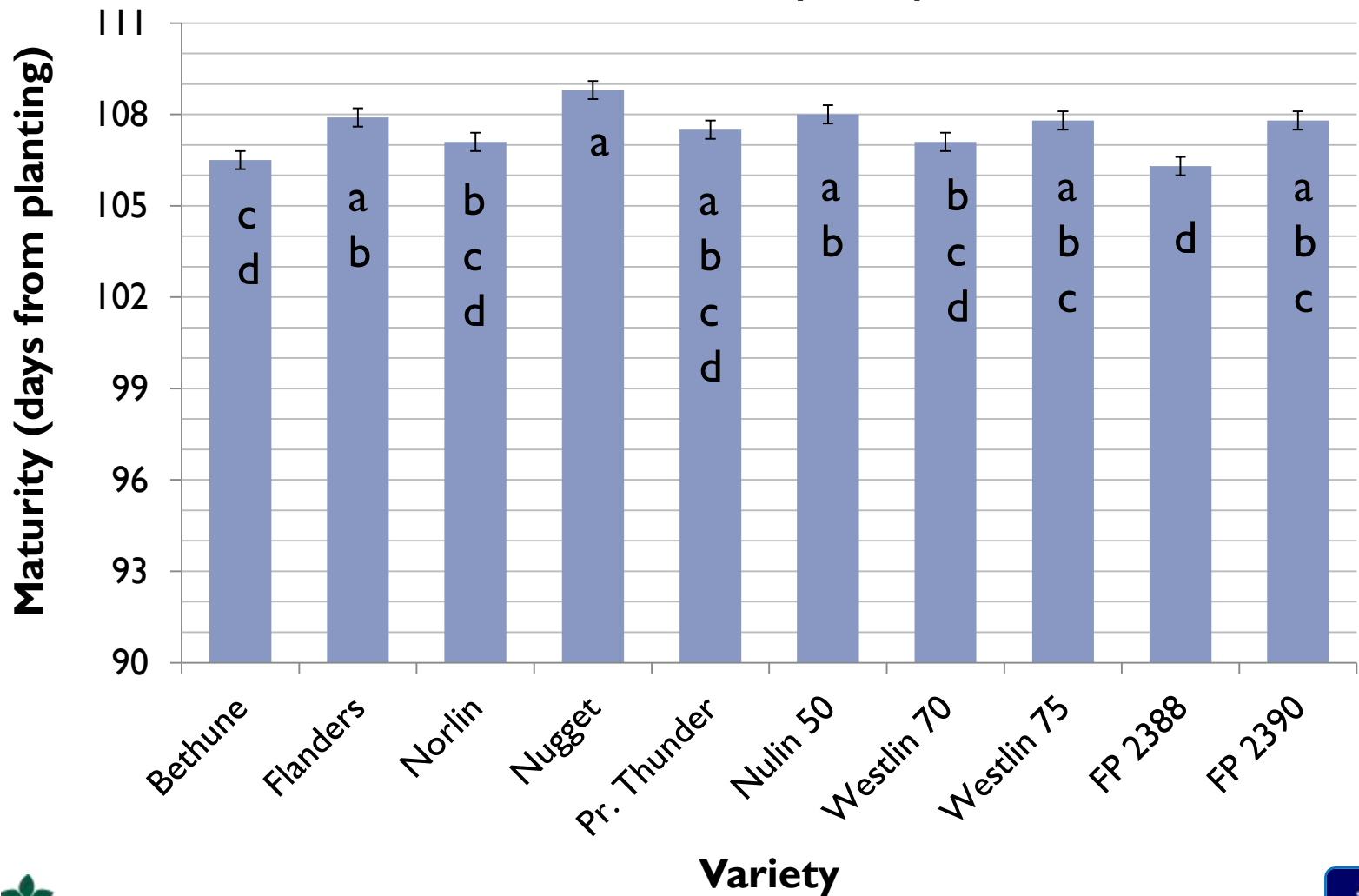
ADOPT Variety Demos 2013-14

#	Variety	2013	2014
1	Bethune (CDC)	×	×
2	Sorrel (CDC)		×
3	Glas (CDC)		×
4	Sanctuary (CDC)		×
5	Neela (CDC)		×
6	FP 2385 (CDC)		×
7	Flanders (CDC)	×	
8	ACC Bravo (AC)		×
9	Prairie Sapphire (AC)		×
10	Prairie Thunder (AC)	×	×
11	Nugget (AC)	×	
12	Norlin (AC)	×	
13	Nulin 50 (CPS)	×	×
14	Westlin 70 (CPS)	×	×
15	Westlin 71 (CPS)	×	×
16	FP 2376 (CPS)		×
17	FP 2388 (CPS)	×	×
18	FP 2390 (CPS)	×	



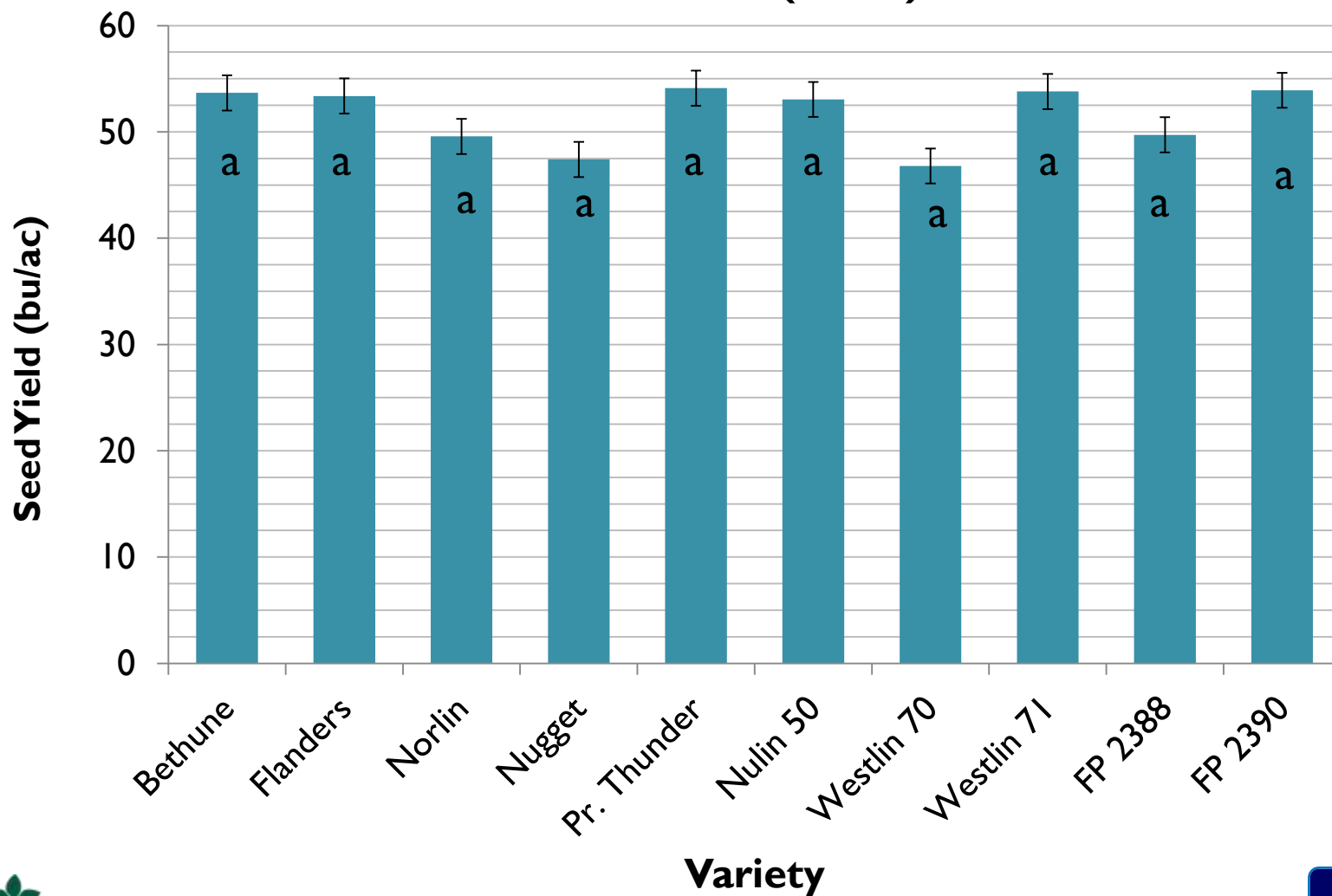
ADOPT Variety Demo - Maturity

Indian Head (2013)



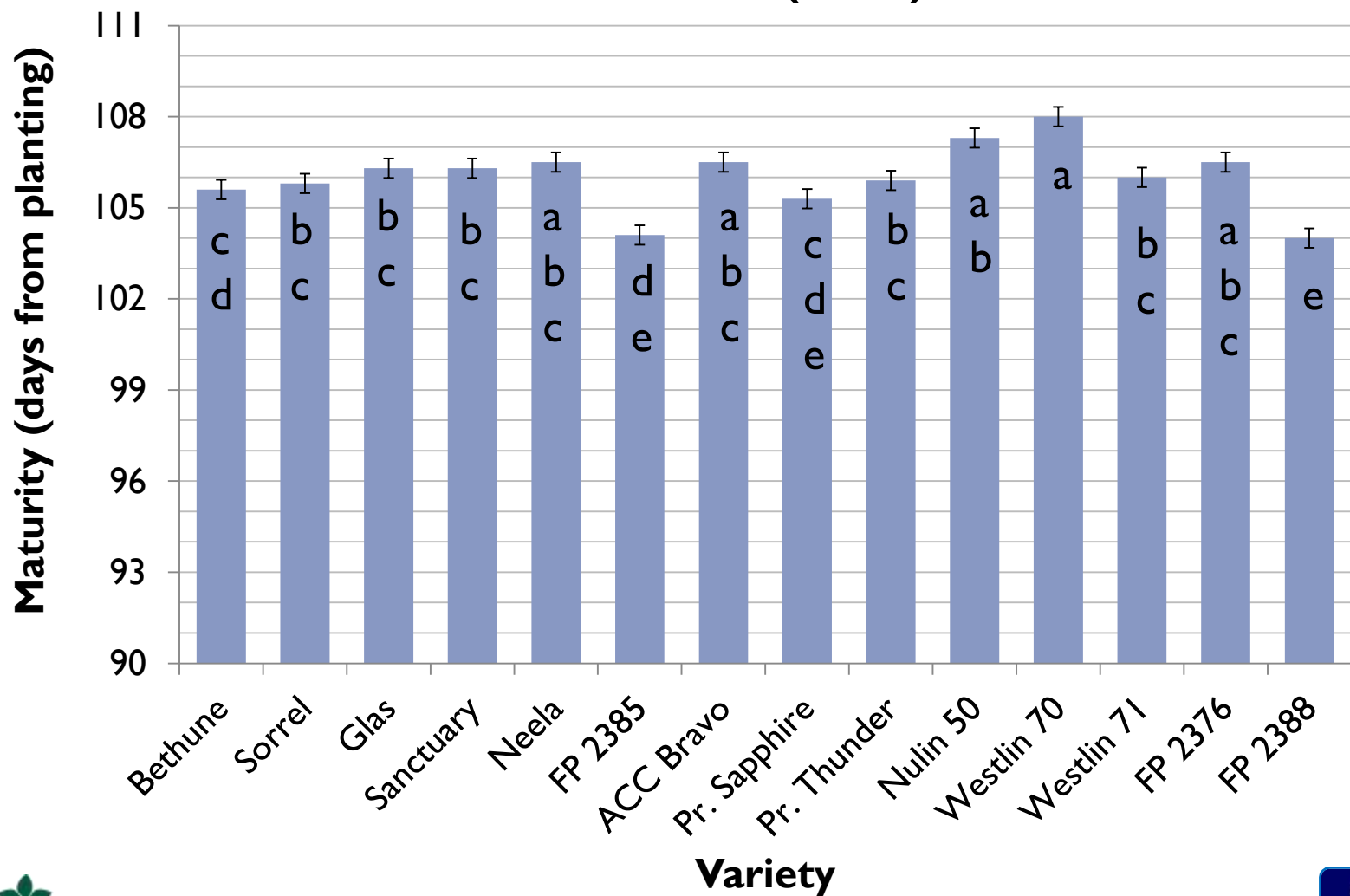
ADOPT Variety Demo – Seed Yield

Indian Head (2013)



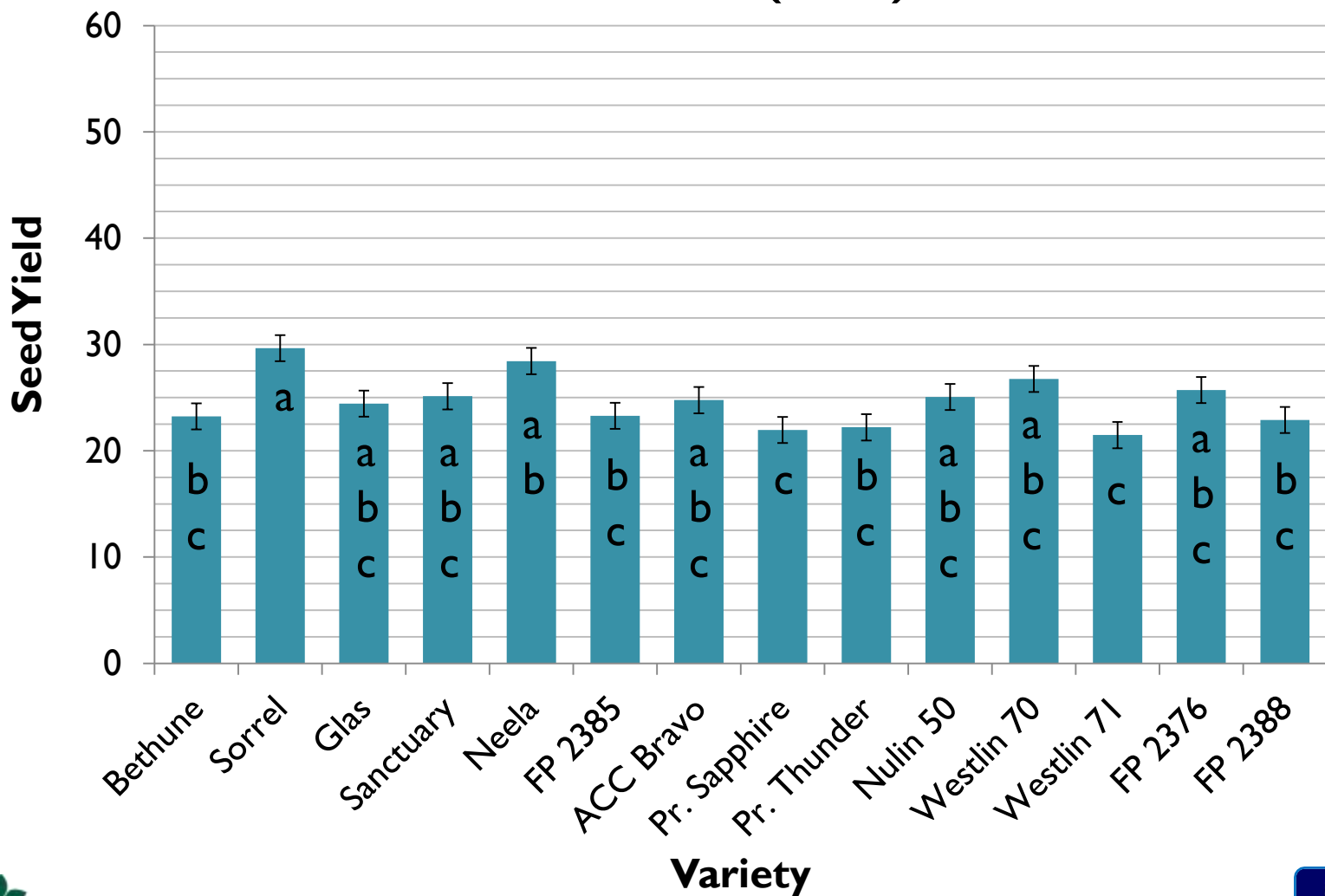
ADOPT Variety Demo - Maturity

Indian Head (2014)



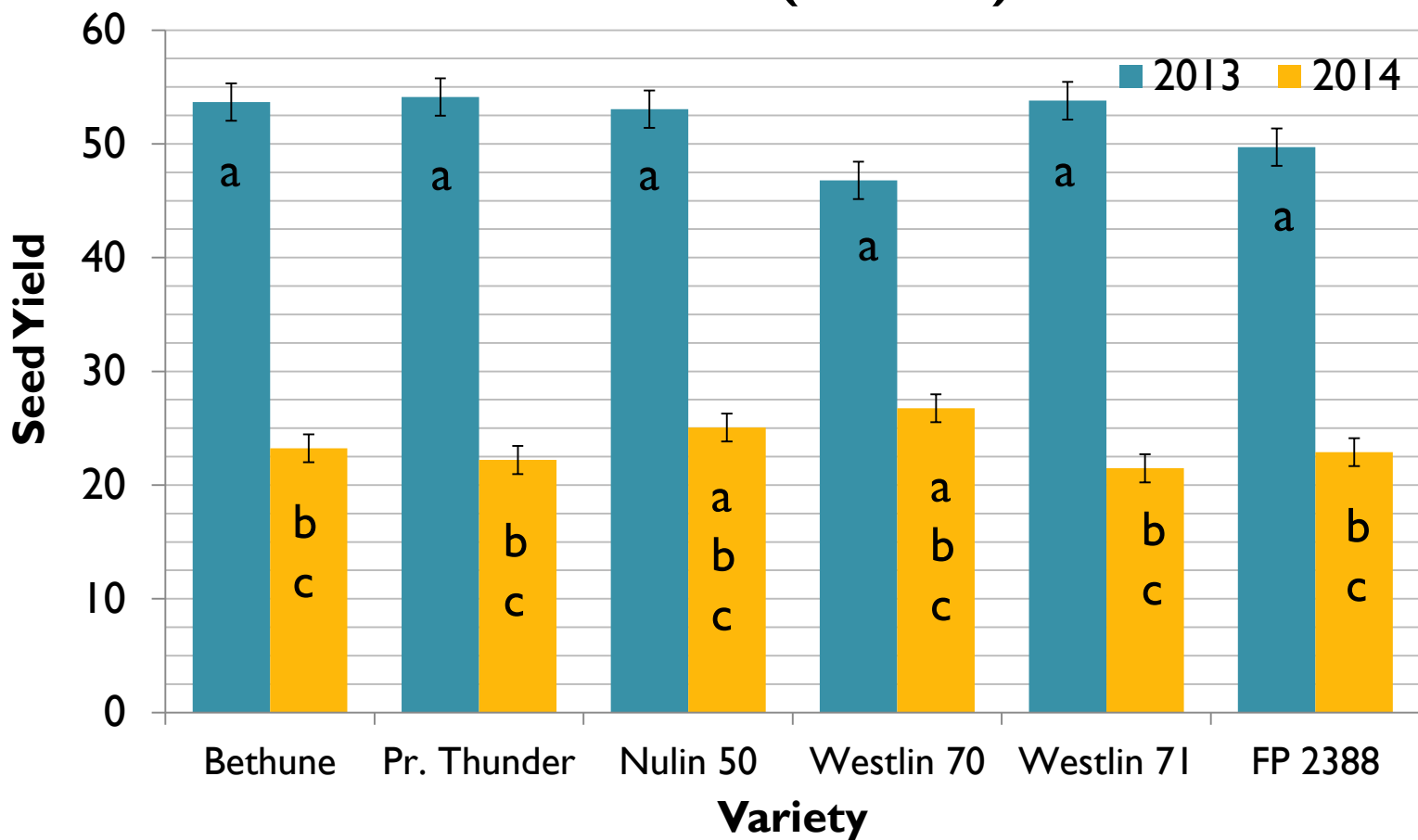
ADOPT Variety Demo – Seed Yield

Indian Head (2014)



ADOPT Variety Demo – Seed Yield

Indian Head (2013-14)



Flax Varieties (SaskSeed 2014)

Flax

Main Characteristics of Varieties

Variety	Years Tested	Yield ¹ (% CDC Bethune)			Relative Maturity ²	Seed Size	Resistance To		
		Area 1&2	Area 3&4	Irrigation			Lodging	Powdery Mildew ³	Fusarium Wilt ³
CDC Bethune	10	100	100	100	L	M	G	MR	MR
CDC Glas	4	104	106	95	L	M	G	MR	MR
Hanley	4	90	90	93	M	M	G	MR	R
Lightning	6	92	92	93	L	M	G	MR	R
Prairie Blue	4	99	92	97	L	S	VG	MR	MR
Prairie Grande	6	92	94	92	M	M	VG	MR	MR
Prairie Thunder	8	95	95	98	M	M	VG	MR	R
CDC Neela	4	103	106	94	L	M	G	MR	MR
CDC Sanctuary	6	106	99	97	L	M	F	MR	MR
CDC Sorrel	8	100	101	92	L	L	G	MR	MR
Taurus	6	94	99	94	M	M	G	R	MR
Vimy	10	94	90	85	M	L	P	MS	MR
AC Watson	6	88	93	92	M	M	G	R	MR

¹ Data from Regional and Coop yield trials.

² Relative maturity: The relative maturity of the check, CDC Bethune, is L (on average 101 days from seeding to swathing ripeness).

³ Resistance Scale: MG = Moderately Susceptible, MR = Moderately Resistant, R = Resistant.

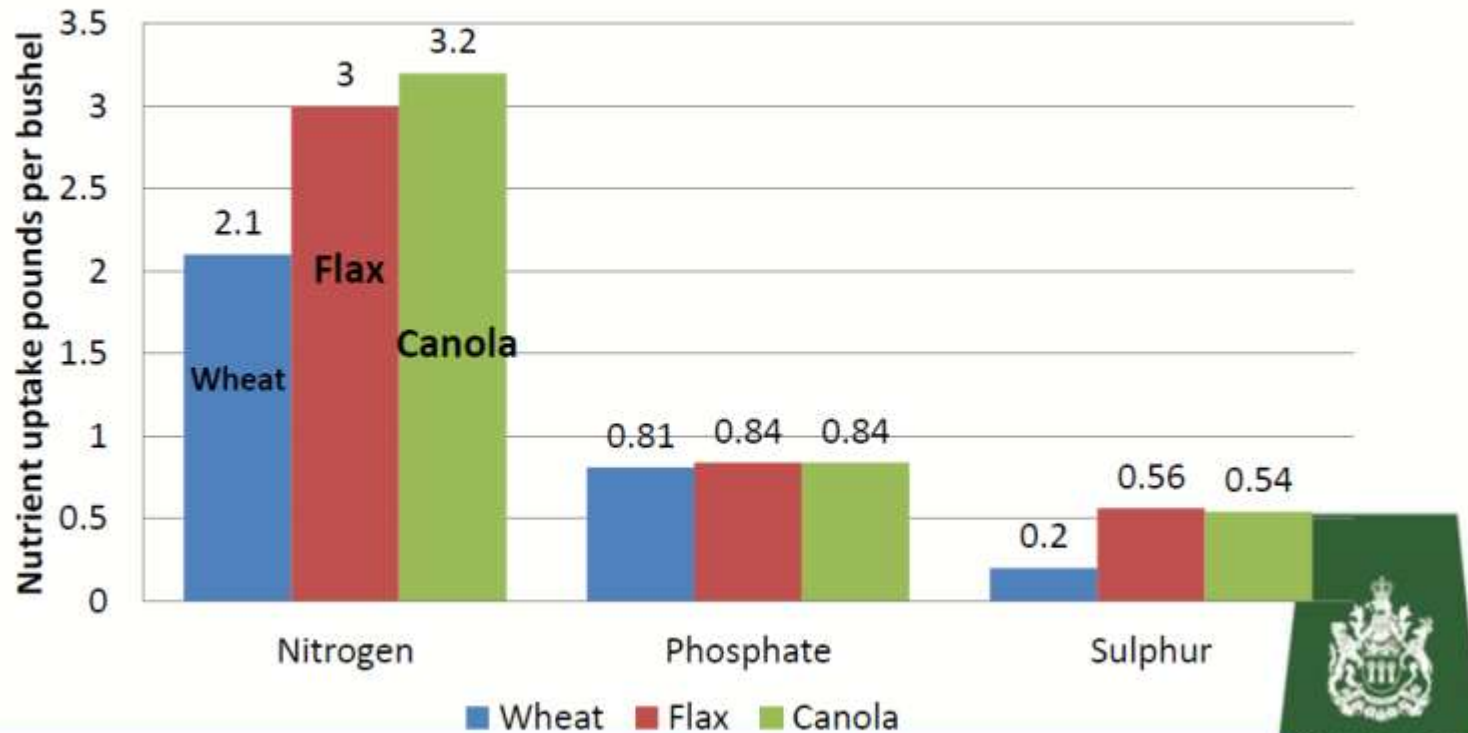
- Refer to provincial seed guides for most complete & regionally relevant variety information



Flax Fertility Considerations

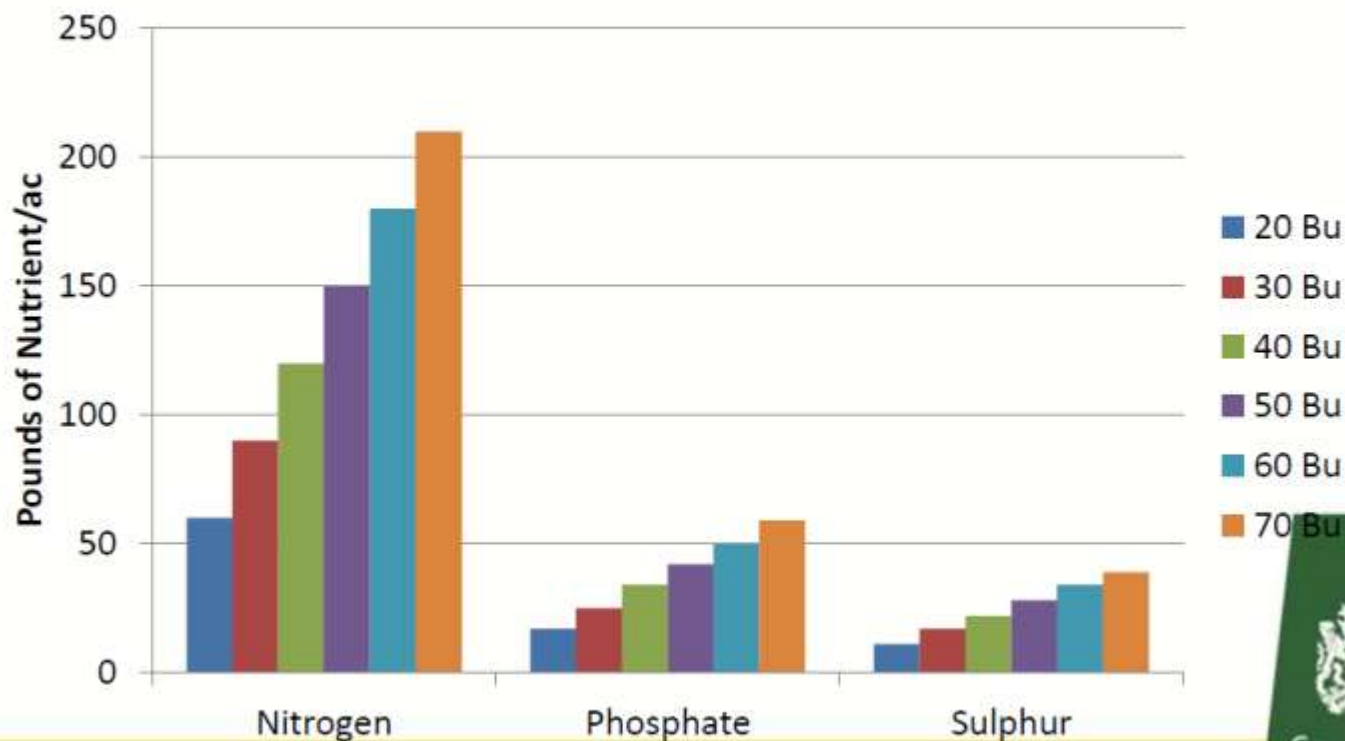
- On average, 24 bu/ac flax crop requires a total (soil + fertilizer) of 70 lb N/ac, 20 lb P₂O₅/ac, 44 lb K₂O/ac and 14 lb S/ac
- Sensitive to seed-placed fertilizer – P₂O₅ rates exceeding 18 lb/ac not recommended
- K and S can limit yields but deficiencies in these nutrients more limited in extent than for N and P
- Flax is a mycorrhizal crop and therefore generally has higher yield following other mycorrhizal crops and in fields with high residual P

Nutrient Uptake by Flax, Wheat, Canola



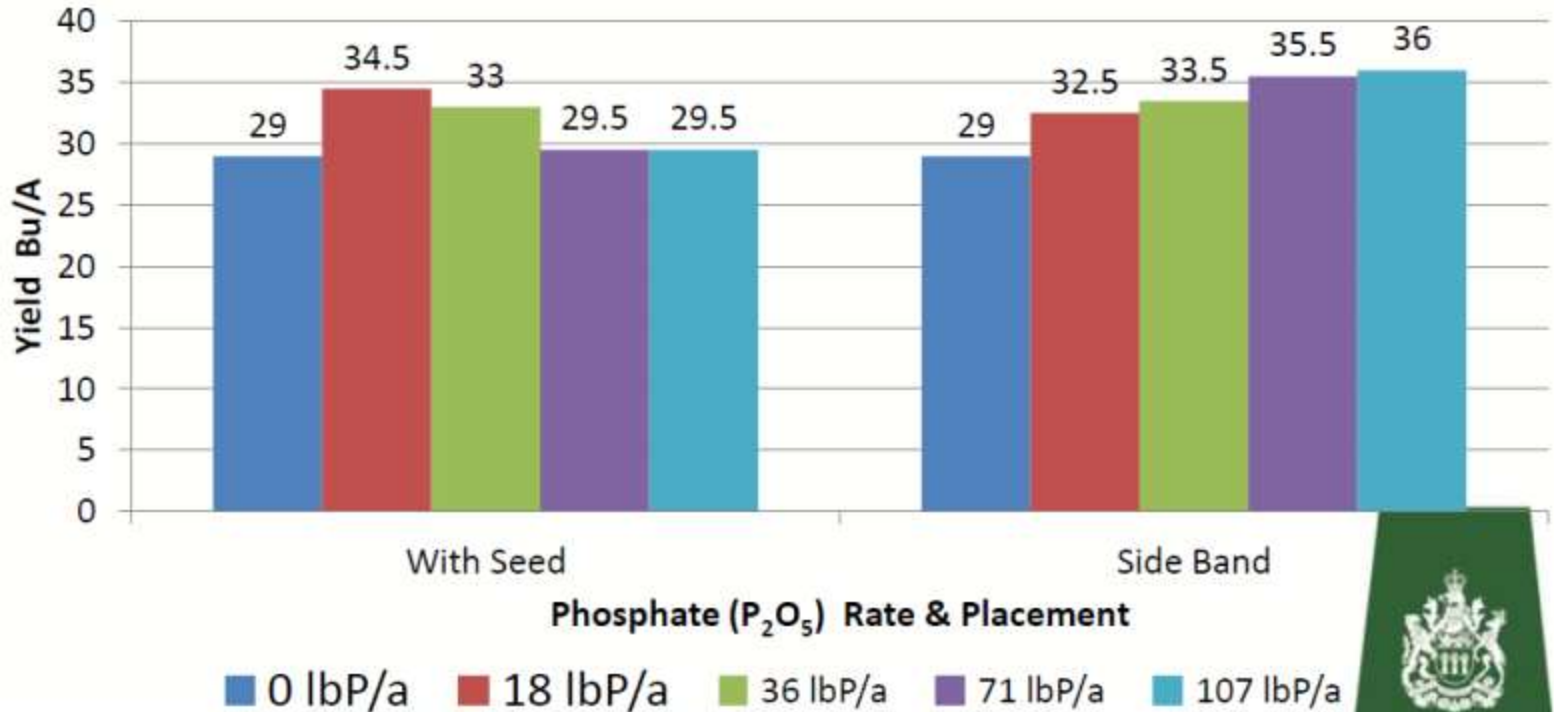
*Source Ken Panchuk – Saskatchewan Ministry of Agriculture

Nutrient uptake by Flax



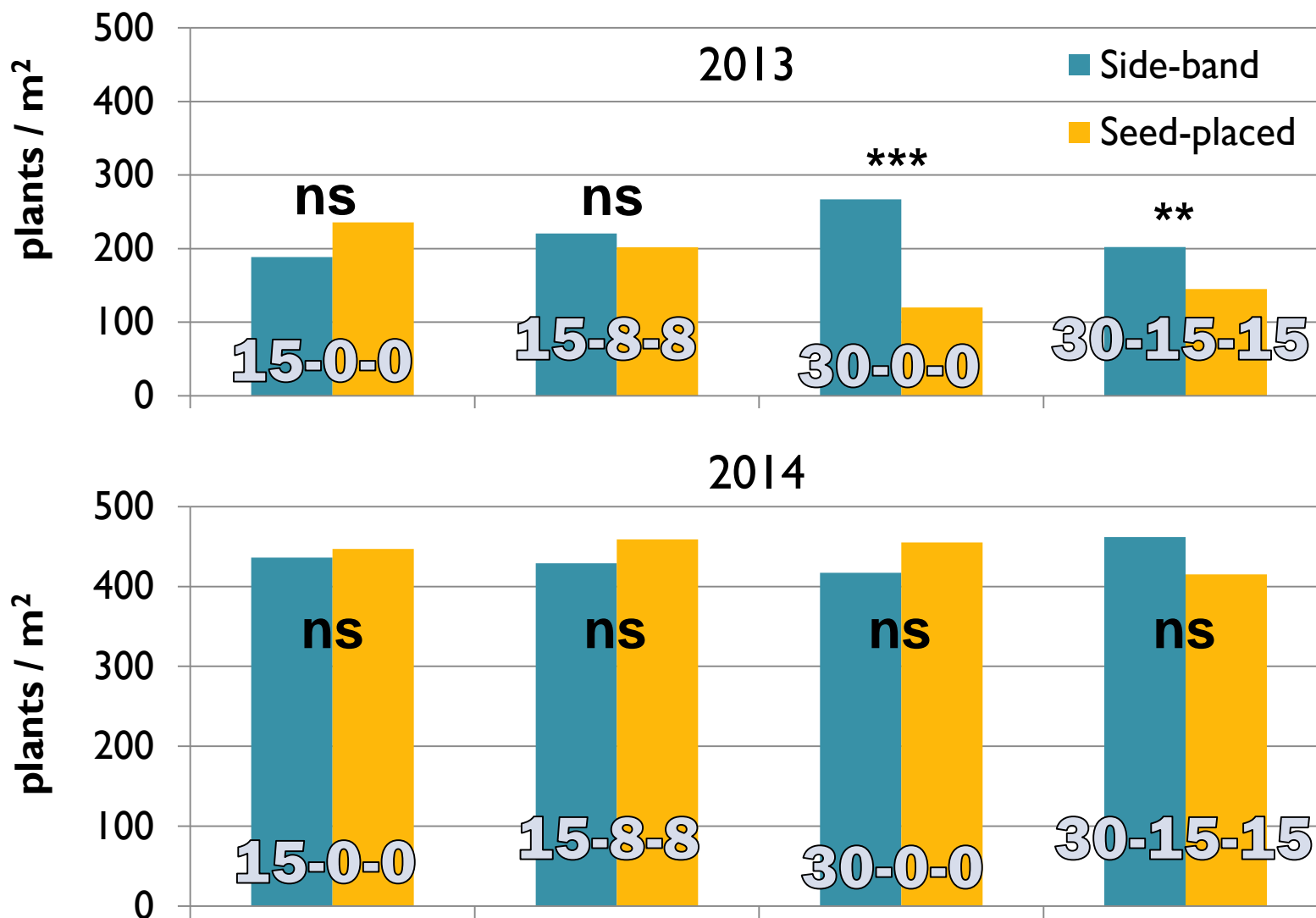
*Source Ken Panchuk – Saskatchewan Ministry of Agriculture

Flax Yield Response to Phosphate-1979



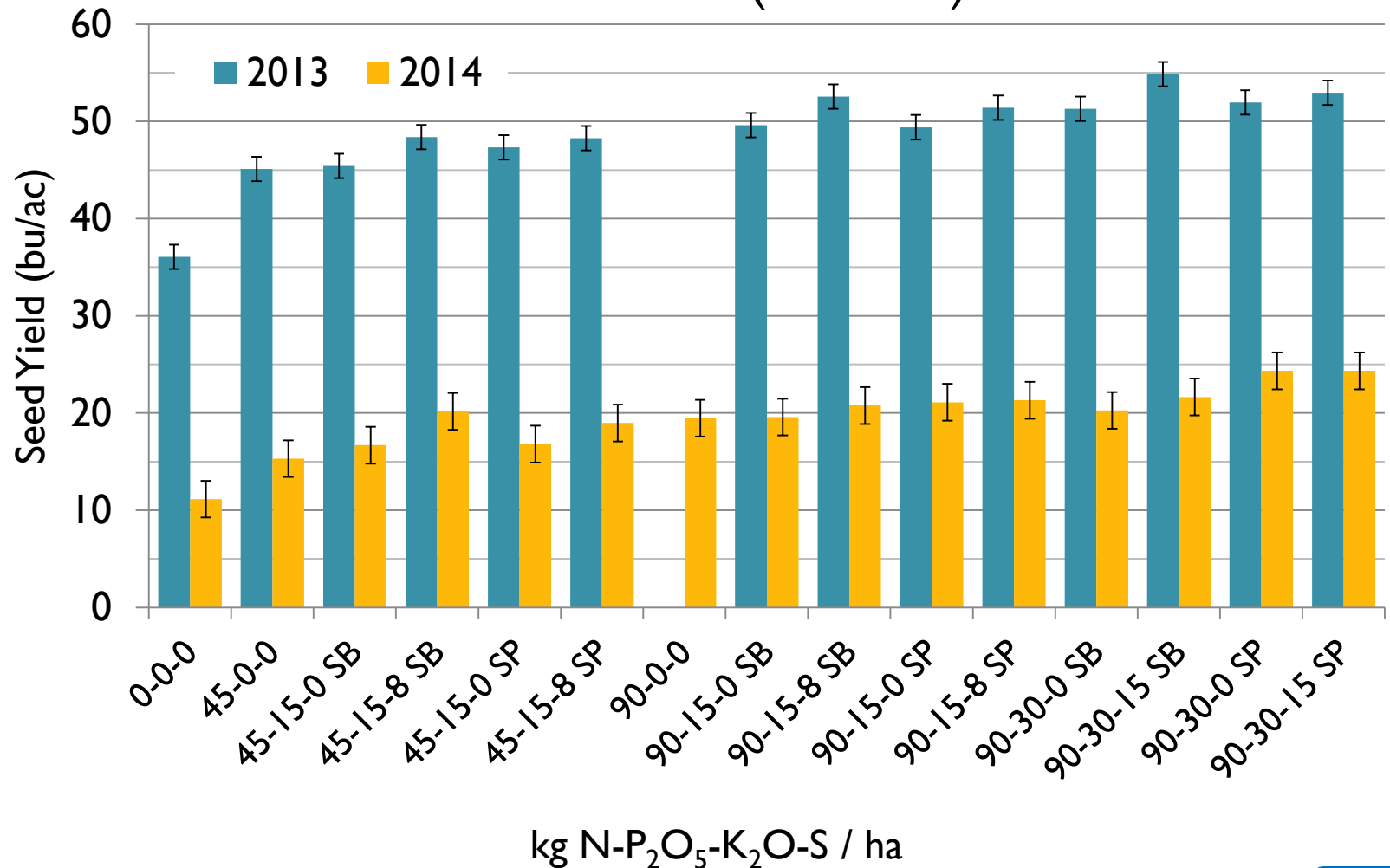
*Source Ken Panchuk – Saskatchewan Ministry of Agriculture

Flax Emergence – Placement Effects

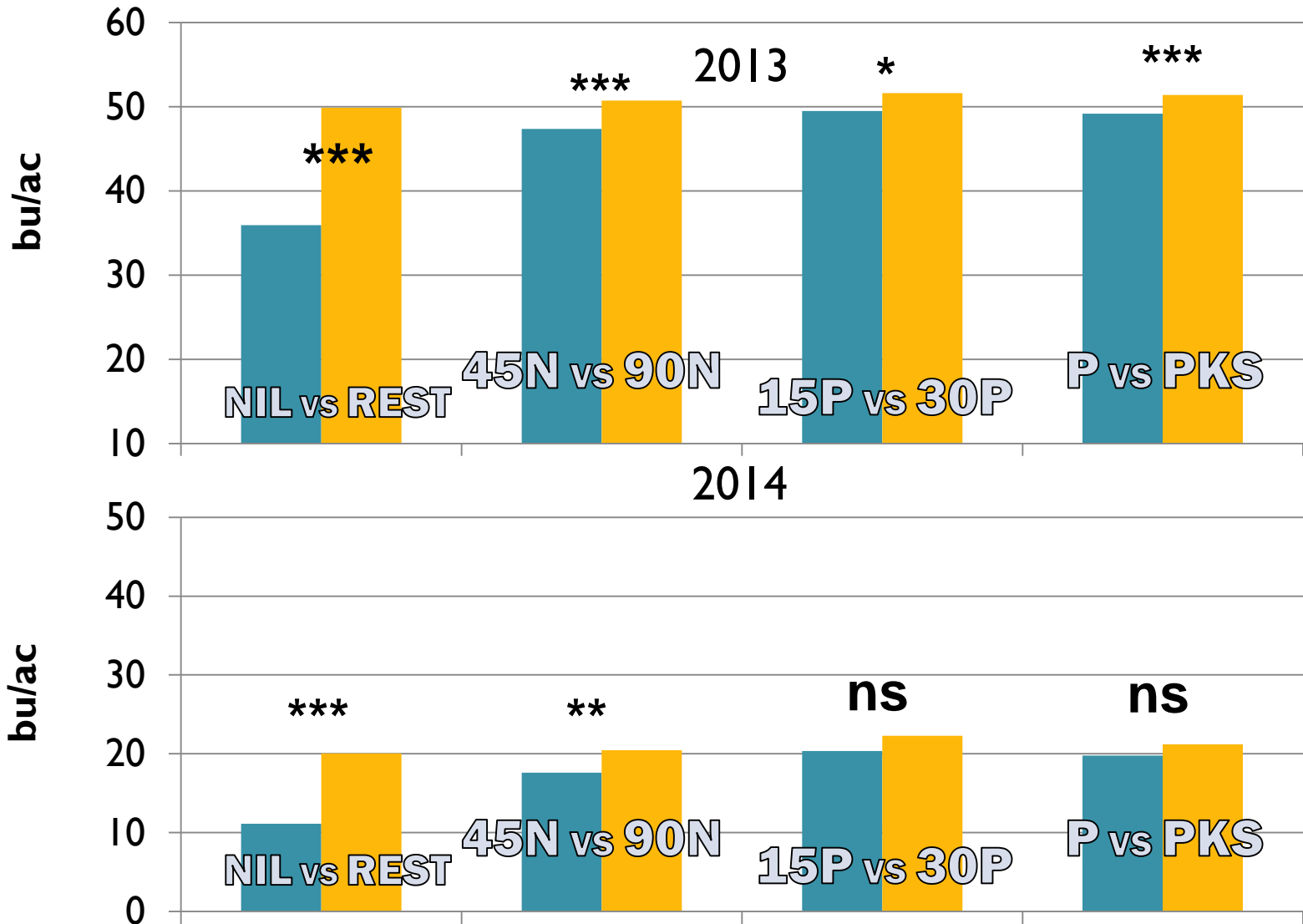


Fertilizer Effects on Flax Yield

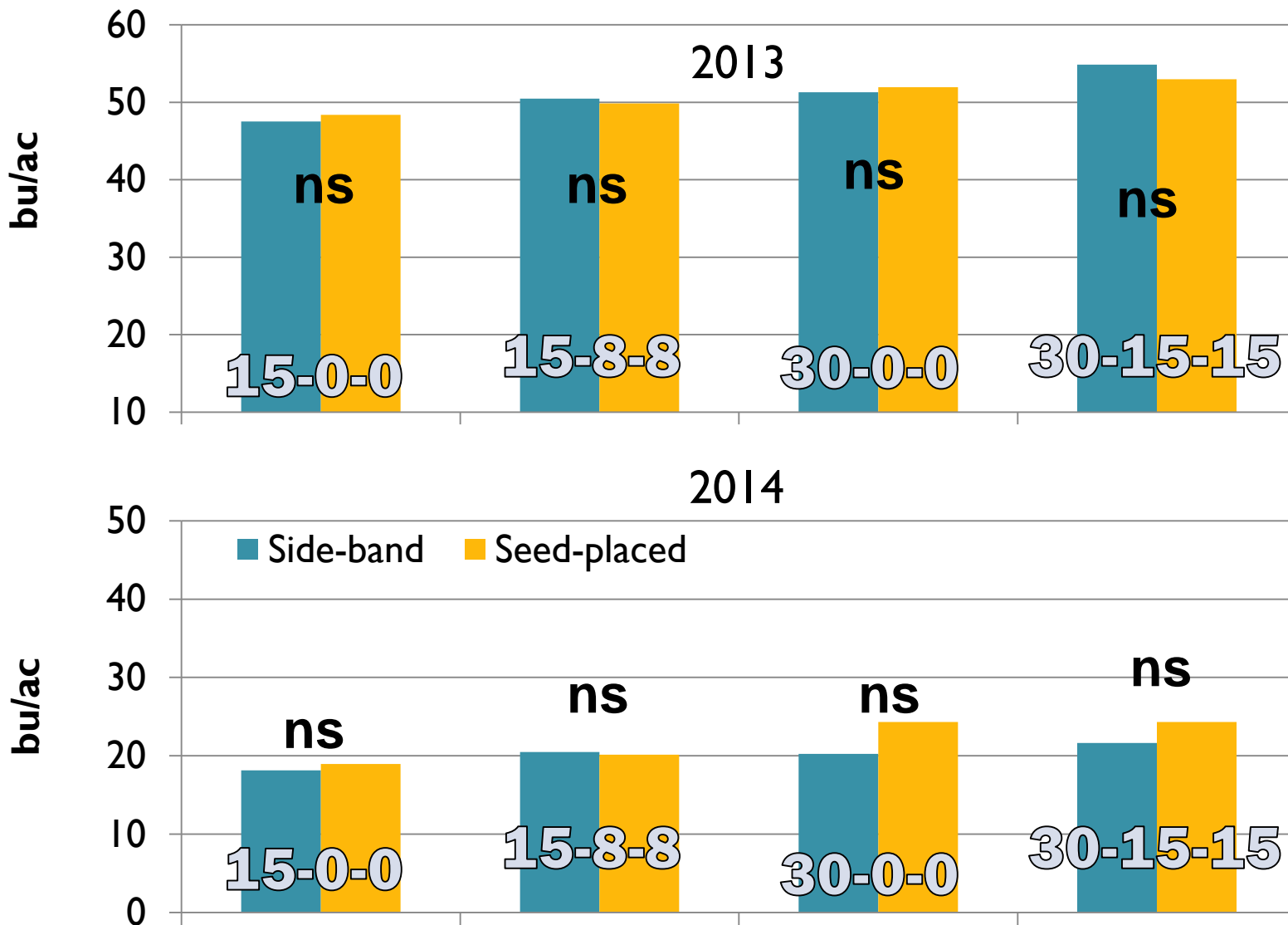
Indian Head (2013-14)



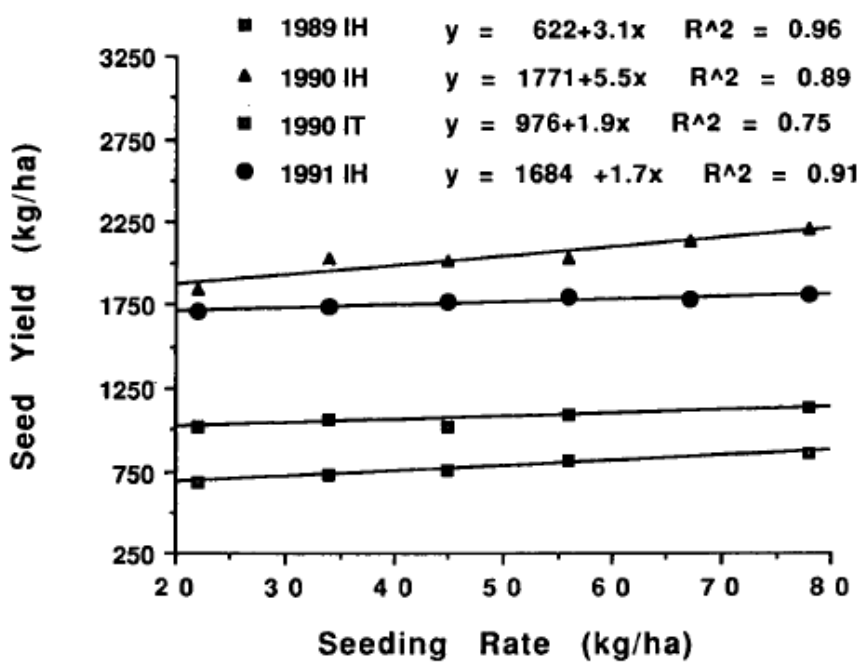
Flax Yield – Product / Rate Effects



Flax Yield – Placement Effects



Optimum Seeding Rate for Flax



Lafond. 1992. Can. J. Plant Sci. 73: 375-382

Table 8. The effects of seeding rate and cultivars on plant density (no. m⁻²), seeds boll⁻¹ and seed yield (kg ha⁻¹), over seeding dates, nitrogen rates and site-years

Cultivar	Seeding rate (kg ha ⁻¹)			
	22	45	67	Mean
	<i>Plant density</i>			
AC McDuff	194	304	410	303
CDC Valour	187	310	416	304
Norlin	220	373	486	359
LSD(0.05)		47.5		
Mean	200	329	437	
	<i>Seeds bolls⁻¹</i>			
AC McDuff	7.3	7.3	7.2	7.3
CDC Valour	7.5	7.4	7.4	7.4
Norlin	7.3	7.1	7.1	7.1
LSD(0.05)		0.19		
Mean	7.3	7.3	7.2	
	<i>Seed yield</i>			
AC McDuff	1335	1447	1490	1424
CDC Valour	1364	1445	1471	1426
Norlin	1401	1436	1424	1420
LSD(0.05)		72		
Mean	1367	1443	1461	

Lafond et. al. 2008. Can. J. Plant Sci. 88: 485-500

- Yield typically increases w/seeding rate; but only by 1.5-5 kg/ha for each additional kg of seed & often no yield benefit to increases past ~45 kg/ha
- Higher densities can hasten maturity so rates of approximately 55 kg/ha often recommended to ensure optimum yield and early maturity

Seeding Rate & Date Effects on Flax

Seeding Dates

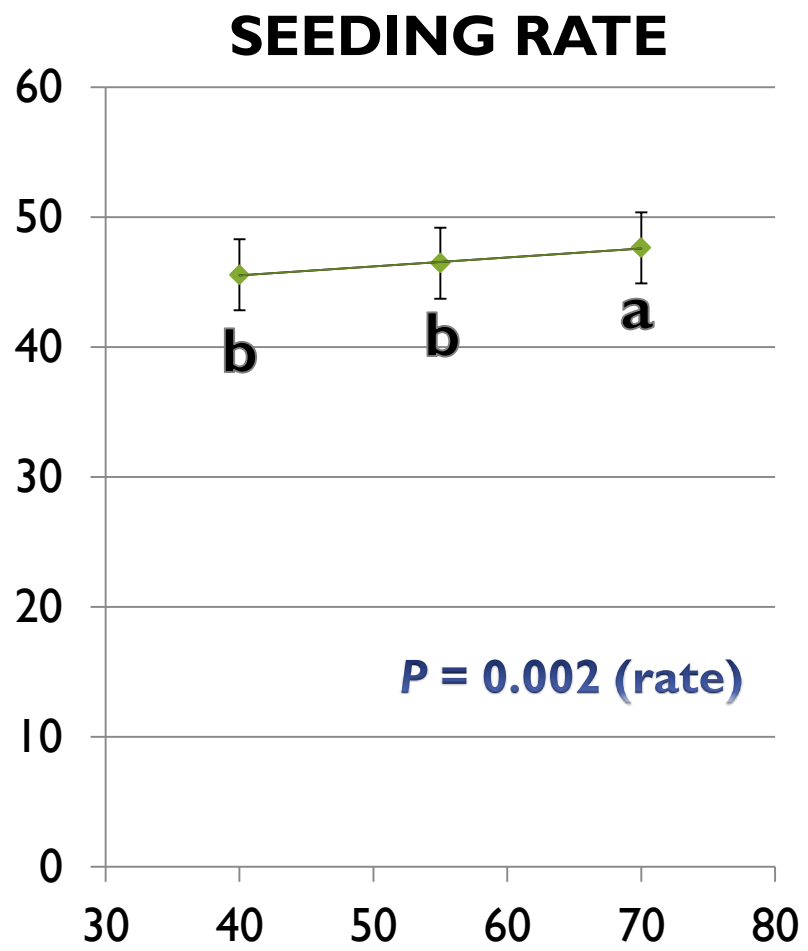
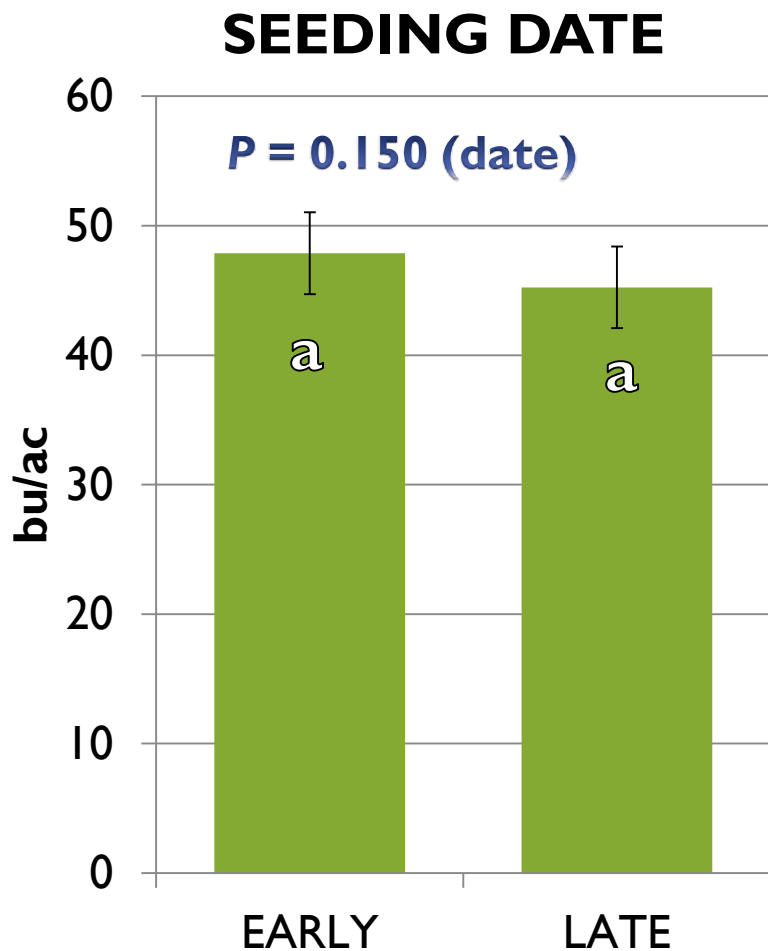
1. Early May
2. Late May

Seeding Rates

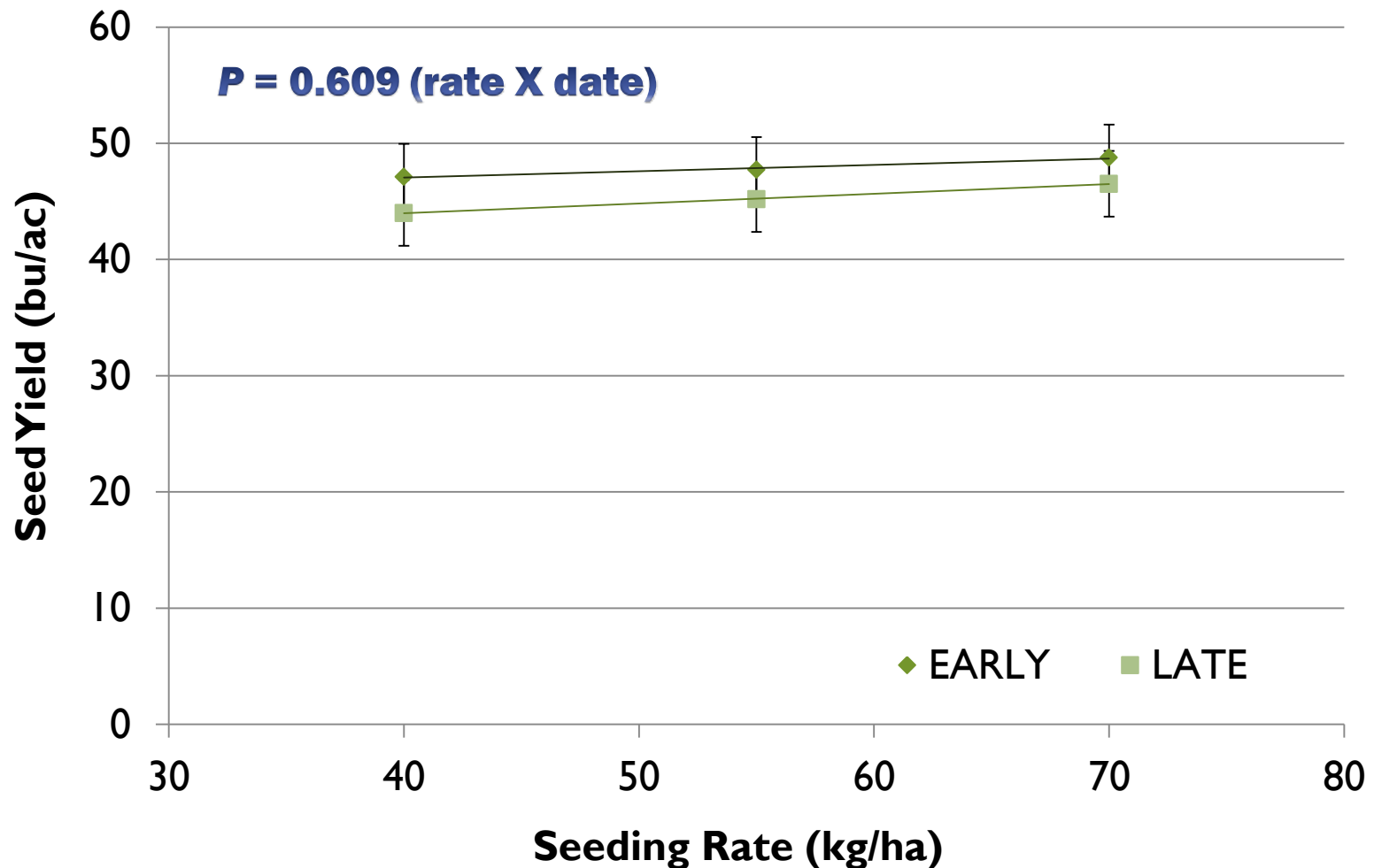
1. Low (31-35 lb/ac)
2. Med (49 lb/ac)
3. High (62-67 lb/ac)



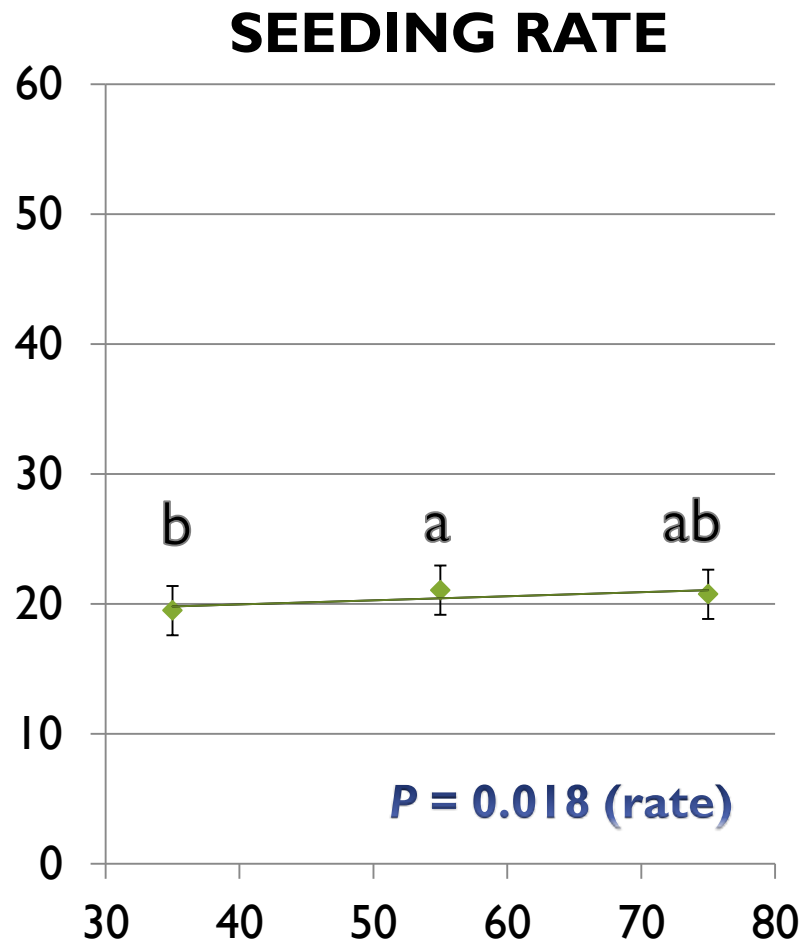
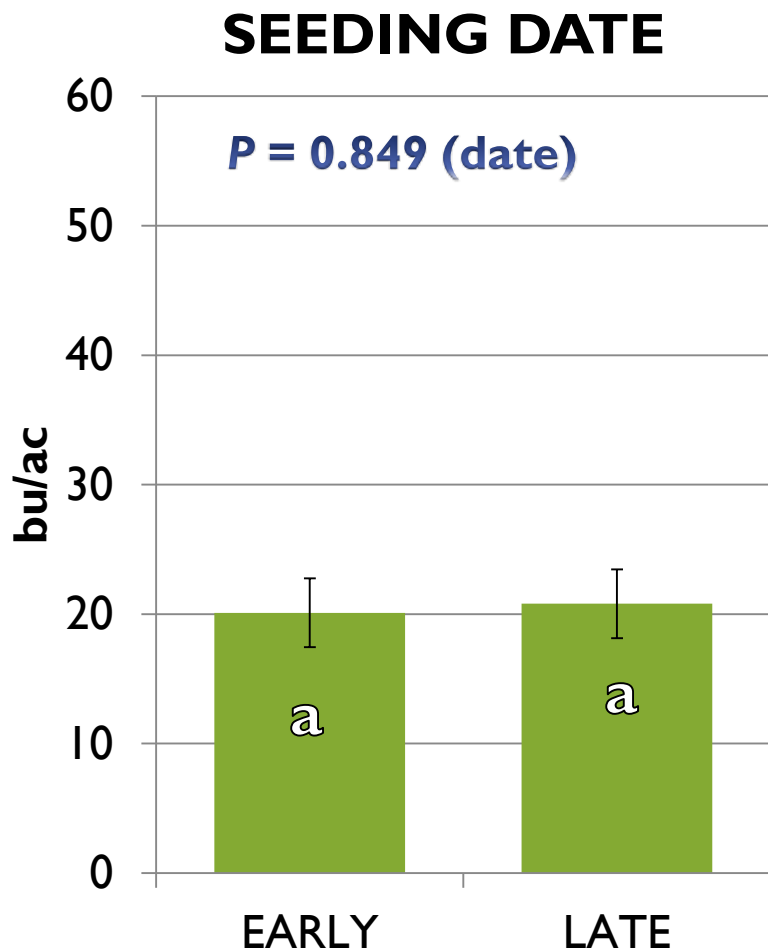
Indian Head 2013 – Seed Yield Main Effects



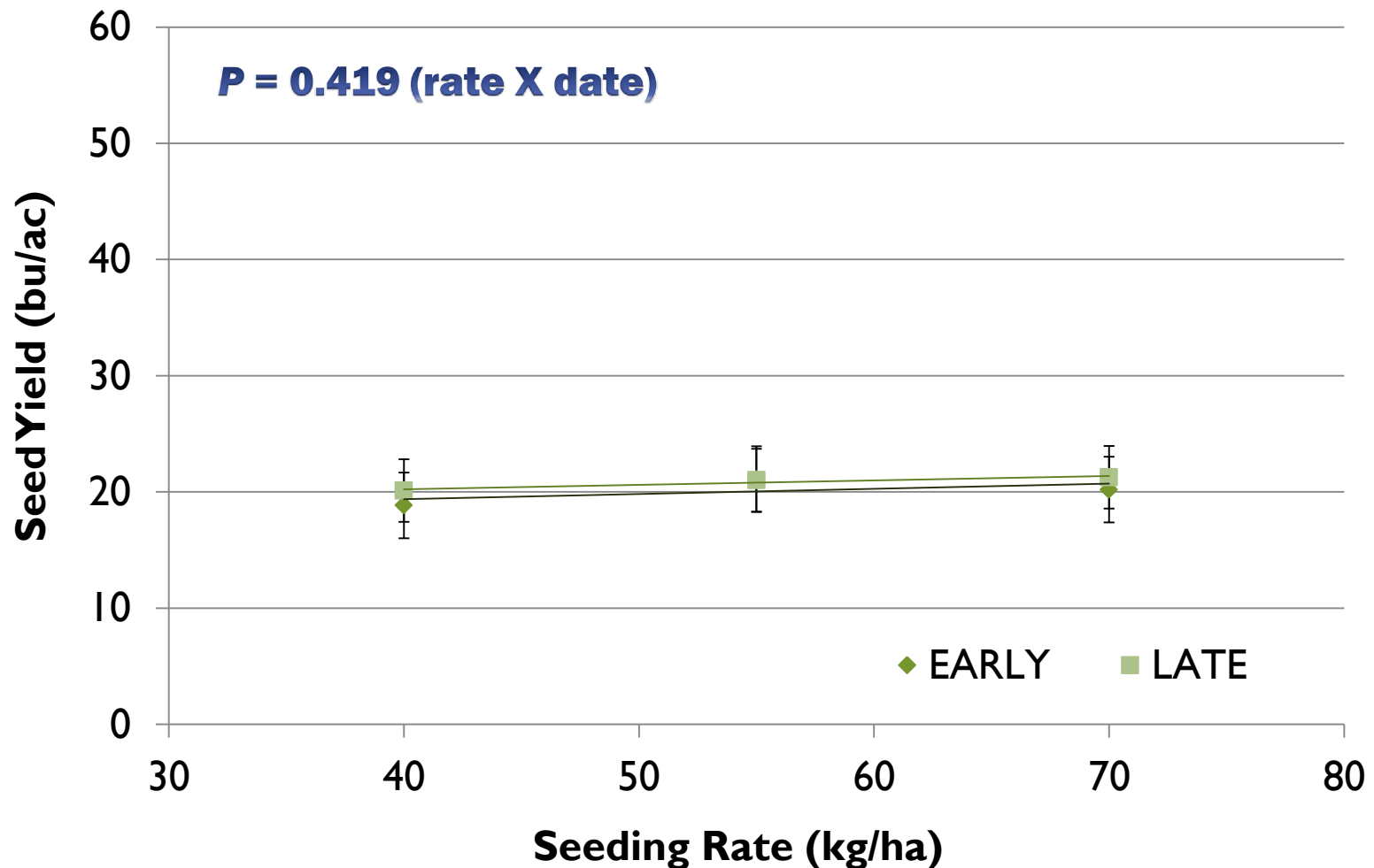
Indian Head 2013 – Seed Yield Interactions



Indian Head 2014 – Seed Yield Main Effects



Indian Head 2014 – Seed Yield Interactions



Optimum Row Spacing for Flax

Table 4. Effects of row spacing on plant density, plant height and yield of flax under zero till for four station-years

Row spacing (cm)	Indian Head			Ituna
	1989	1990	1991	1990
<i>Plant density</i>				
(m ⁻²)				
10	320	277	610	200
20	264	244	552	176
30	234	235	485	132
SE	9.9	13.8	17.7	12.3
Orthogonal contrast				
20 vs. 10 and 30	NS	NS	NS	NS
10 vs. 30	0.0001	0.04	0.0001	0.0002
<i>Plant height</i>				
(cm)				
10	39	52	67	63
20	41	54	68	65
30	41	55	67	66
SE	0.6	0.5	0.3	0.7
Orthogonal contrast				
20 vs. 10 and 30	NS	NS	NS	NS
10 vs. 30	0.05	0.0005	NS	0.0006
<i>Seed yield</i>				
(kg ha ⁻¹)				
10	749	2037	1756	1052
20	810	2087	1761	1104
30	719	2013	1790	1020
SE	26	40	15	21
Orthogonal contrast				
20 vs. 10 and 30	0.03	NS	NS	0.01
10 vs. 30	NS	NS	NS	NS

- Lafond (1992) showed declining plant density, increased height and no effect on yield as row spacing increased from 10 to 30 cm (Can. J. Plant Sci. 93: 375-382)

Row Spacing Effects on Flax Establishment and Yield

Row Spacing

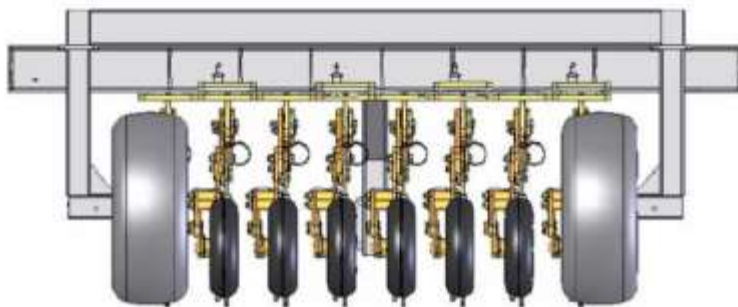
Levels Tested †

1. 10" (25 cm)
2. 12" (31 cm)
3. 14" (36 cm)
4. 16" (41 cm)
5. 24" (61 cm)

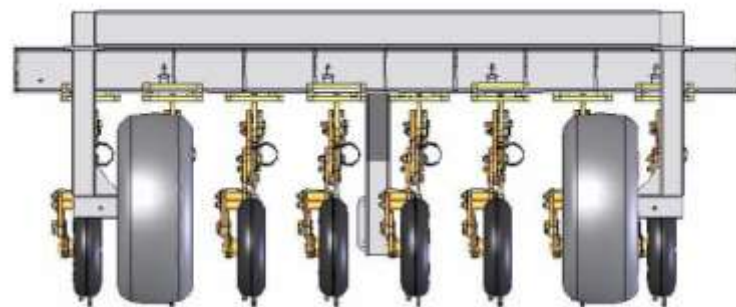


Opener Positions at Various Row Spacing Configurations

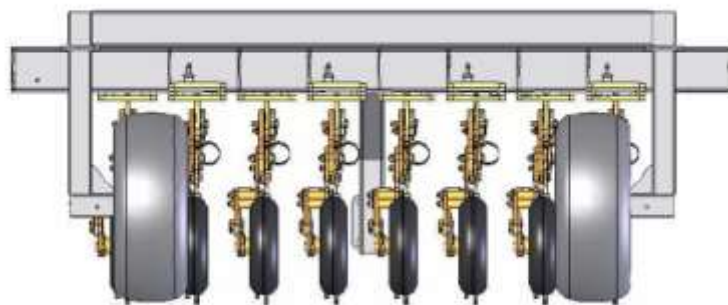
10 inch spacing



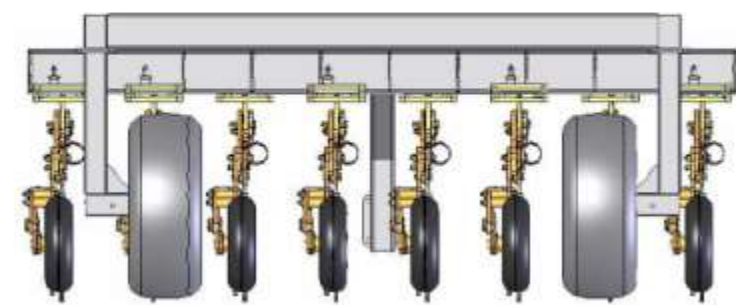
14" cm Spacing



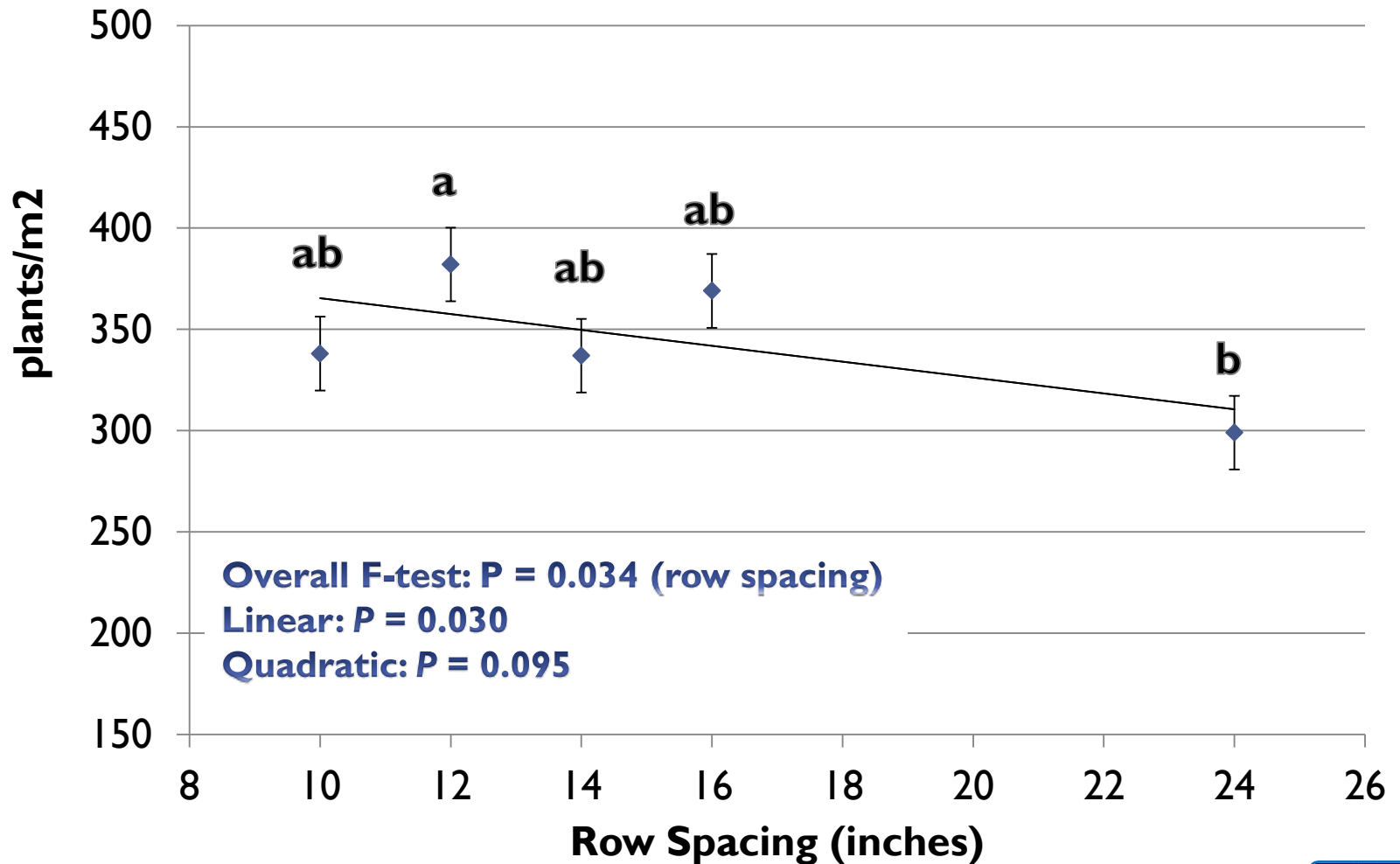
12" cm spacing



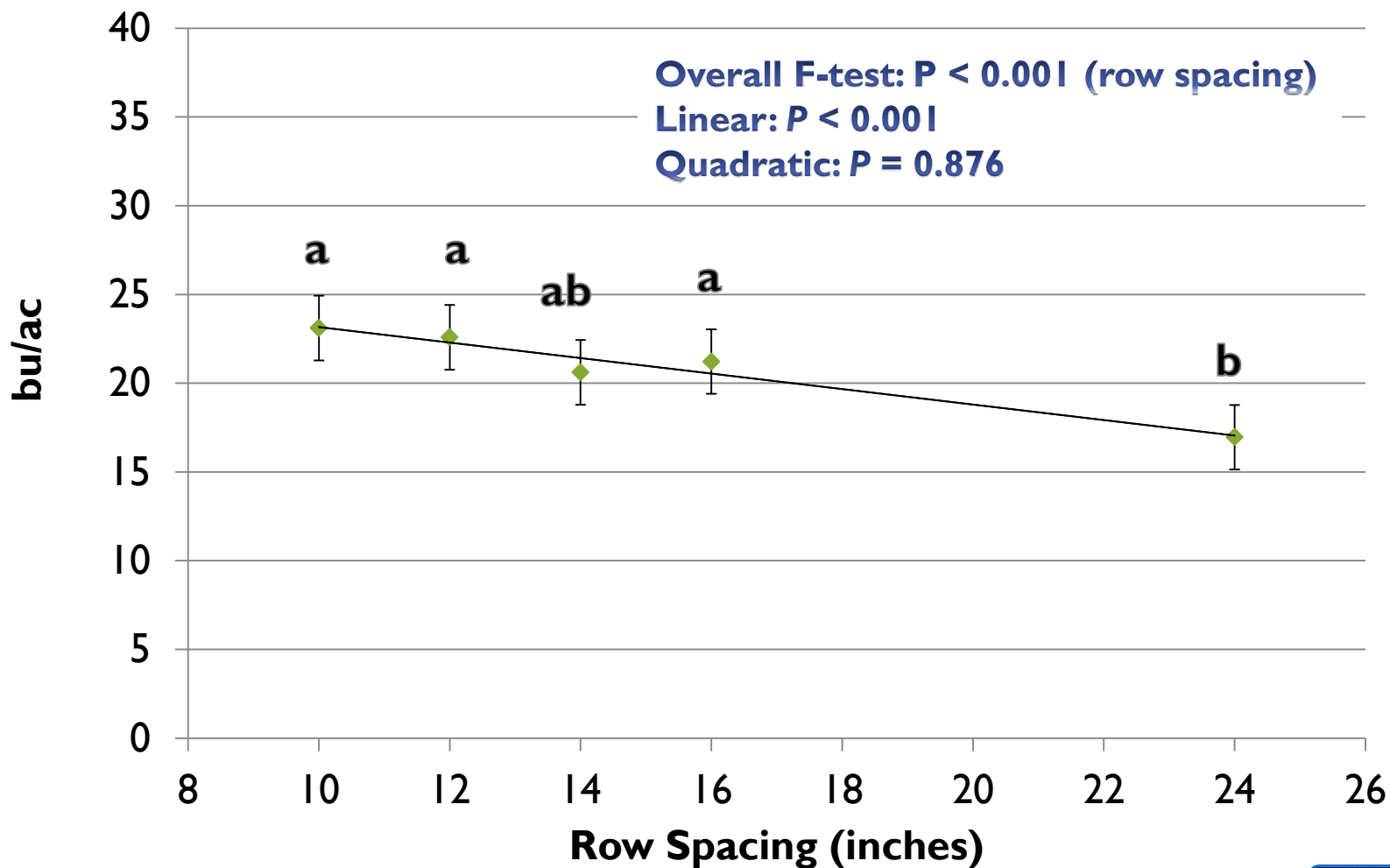
16" cm Spacing



Row Spacing Effects on Flax Establishment



Row Spacing Effects on Flax Yield



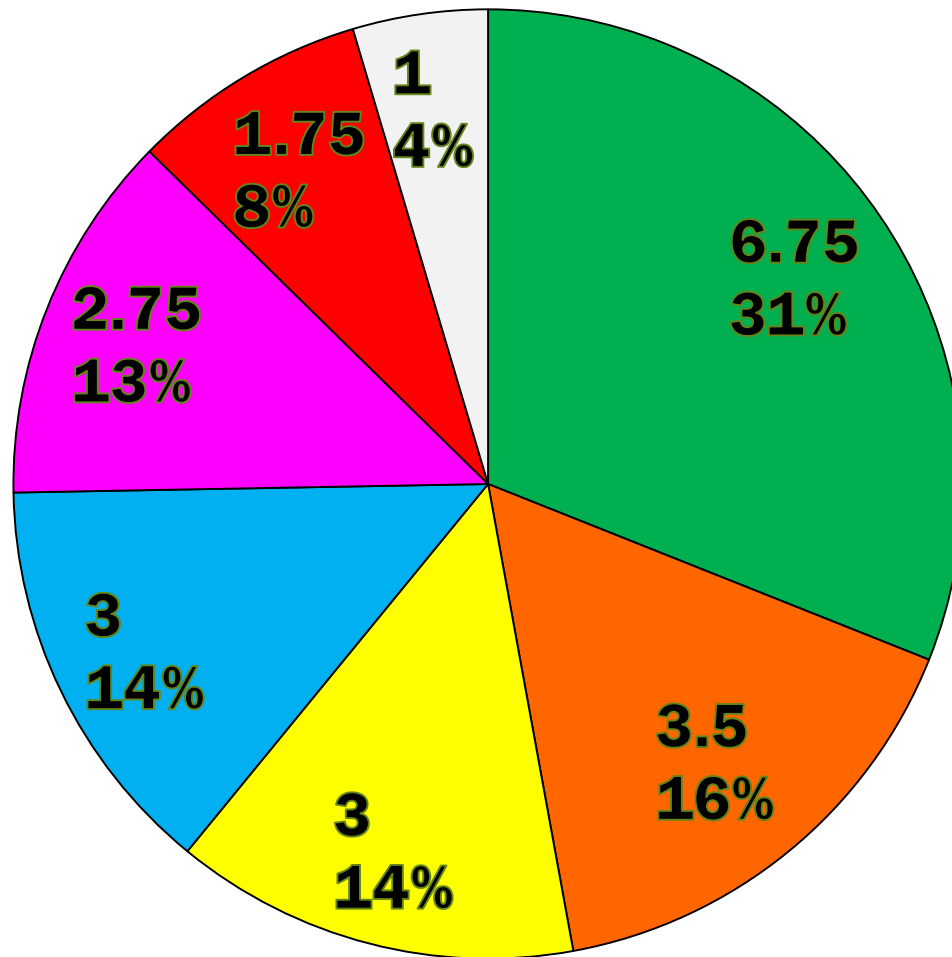
Broadleaf Herbicide Options

ADOPT HERBICIDE DEMO Indian Head-2013

1. Check (no broadleaf herbicide)
2. MCPA Ester
3. Authority (sulfentrazone)
4. Authority + Buctril M
5. Buctril M (MCPA + bromoxynil)
6. Curtail M (MCPA + clopyralid)



Weeds Present (#/m²) Indian Head 2013



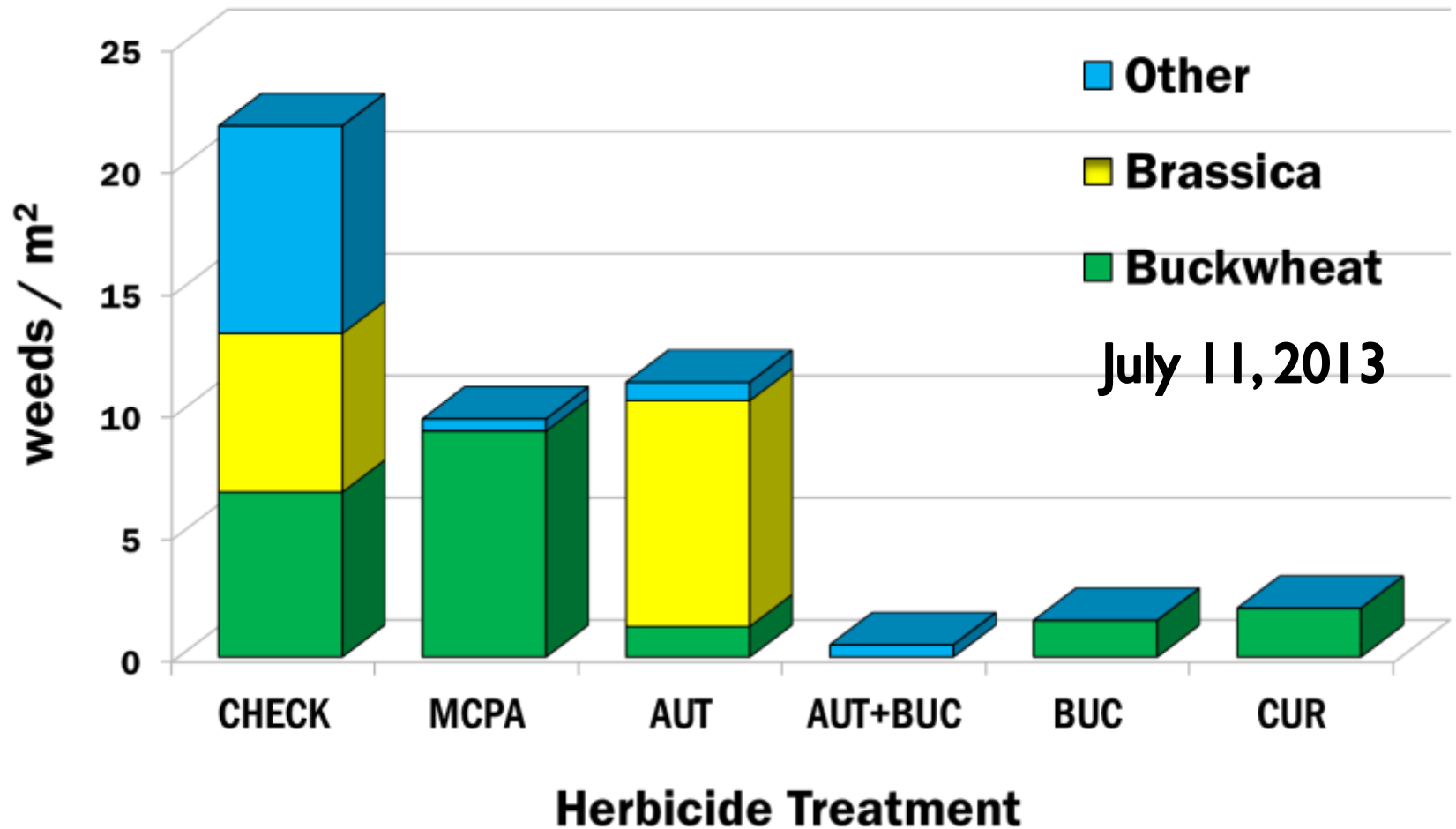
- Wild Buckwheat
- Wild Mustard
- Volunteer Canola
- Prickly Lettuce
- Lamb's Quarters
- Canada Thistle
- Misc.

- Total = 22 weeds/m²
- Weeds observed in the untreated check (July 11)

No Herbicide Applied (IH-13)



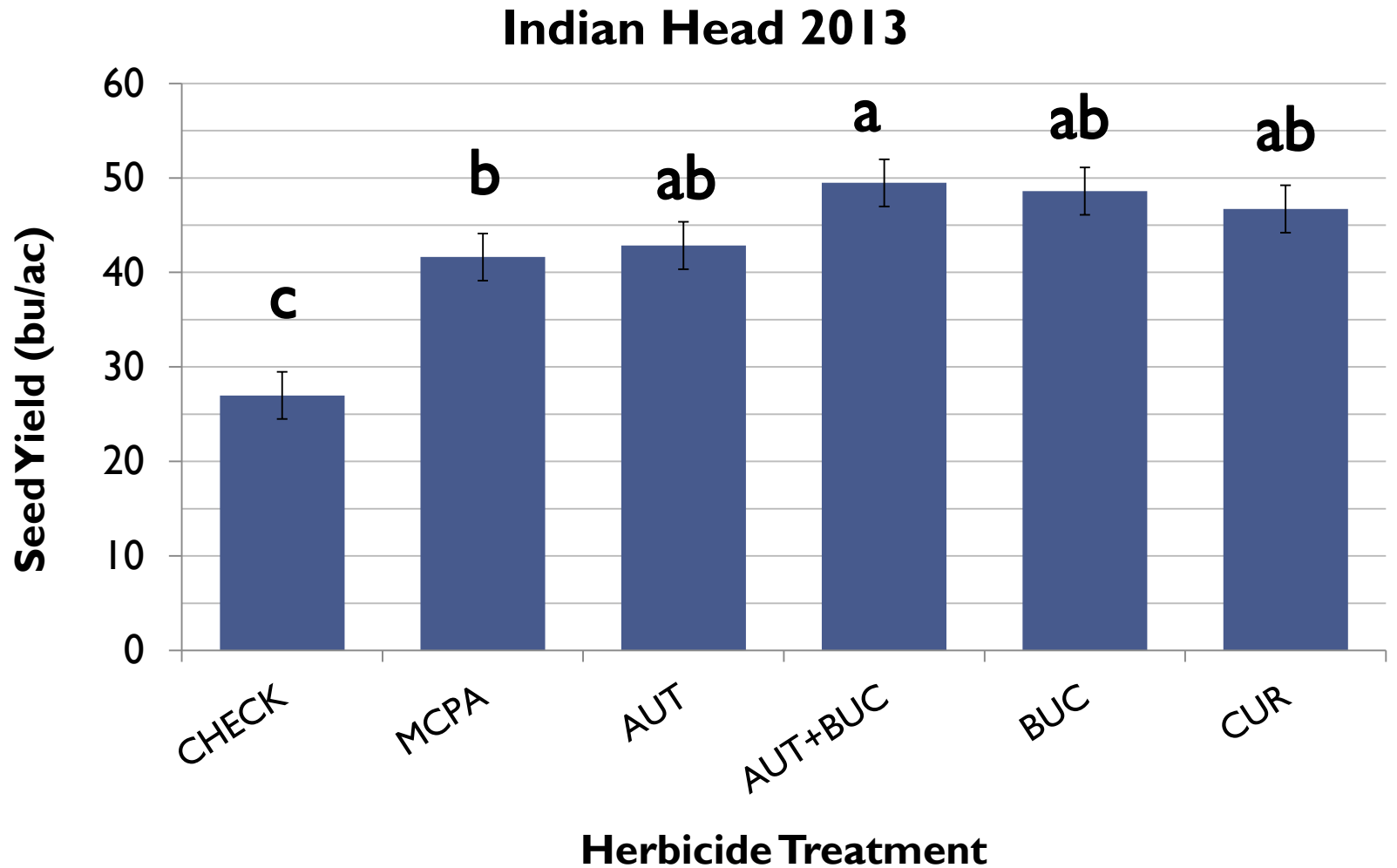
Weeds Present (#/m²)



Authority + Buctril M (IH-13)



Broadleaf Herbicide Effects on Flax Yield



Foliar Fungicide Effects on Flax Yield

Treatments

1. Check

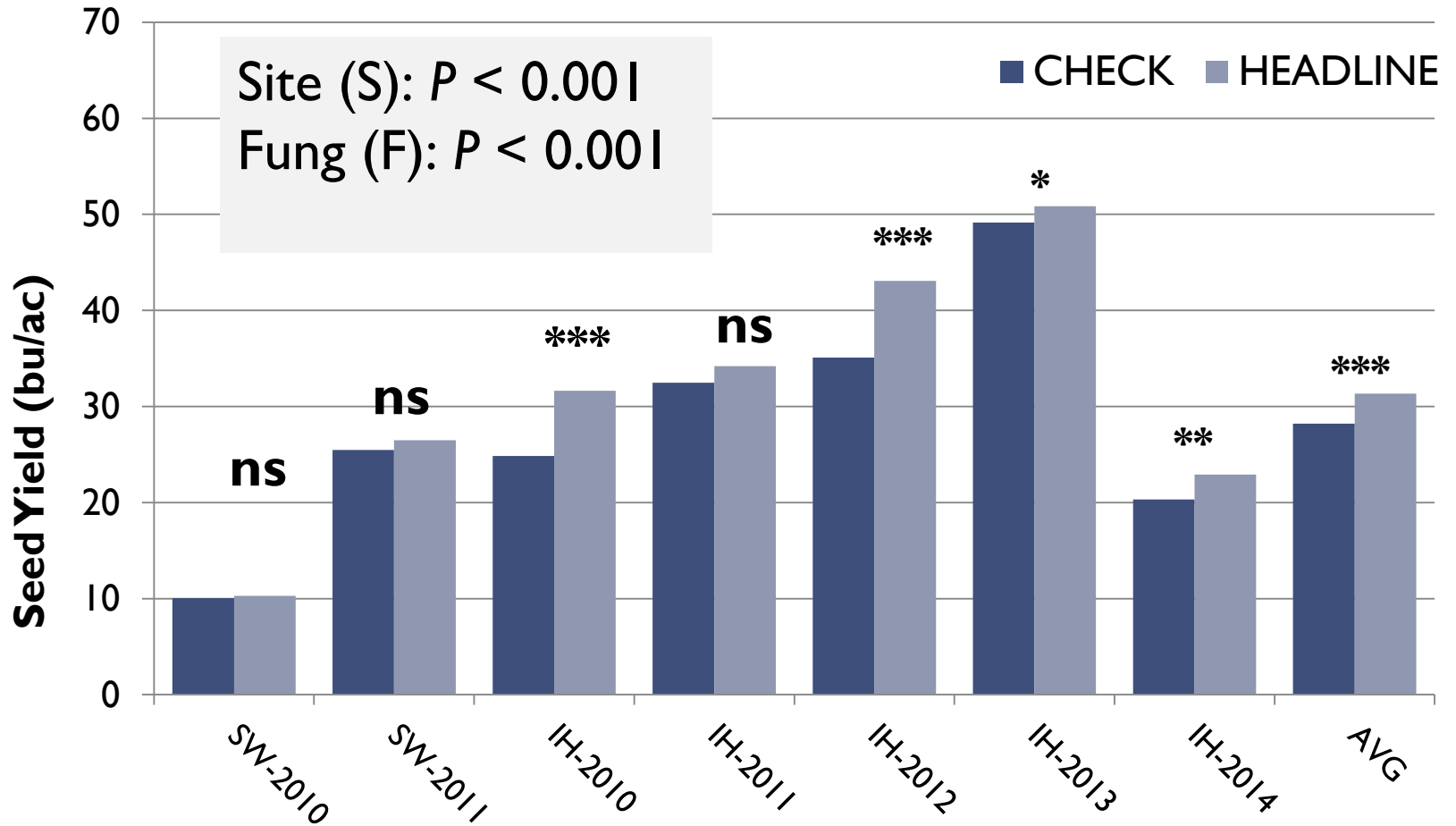
- no fungicide

2. 0.16 l/ac Headline

- full bloom



Fungicide Response by Site



ns – not significant; * – $0.05 < P < 0.100$; ** – $0.01 < P \leq 0.05$; *** – $P \leq 0.001$

Visible Response to Fungicide Indian Head 2010



What about Seed Treatments?

Locations:

1. Indian Head (13)
2. Melfort (13)

Seed Treatments:

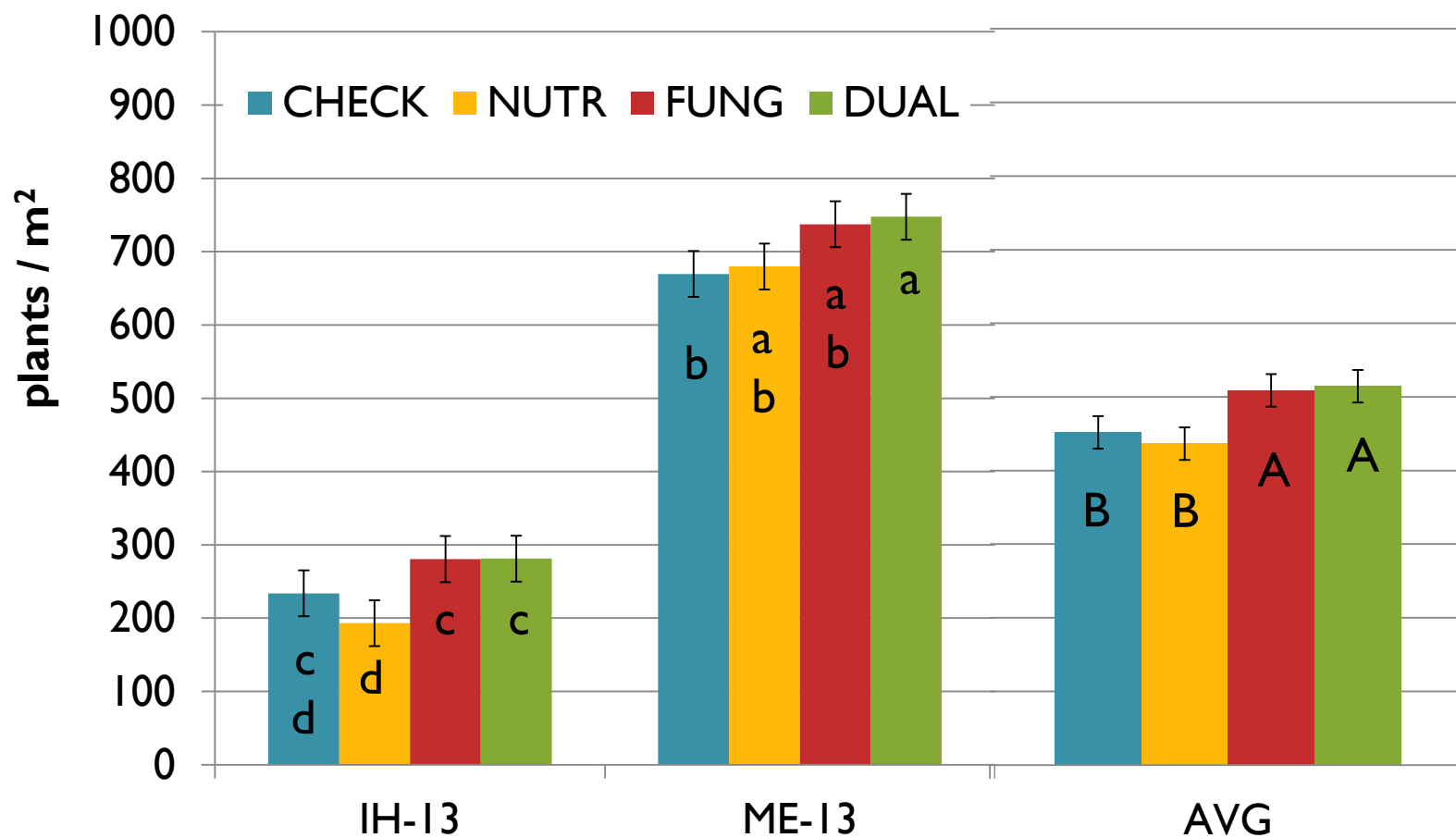
1. Check
2. Fungicide (Vitaflo)
3. Nutrient (Awaken)
4. Fungicide + Nutrient



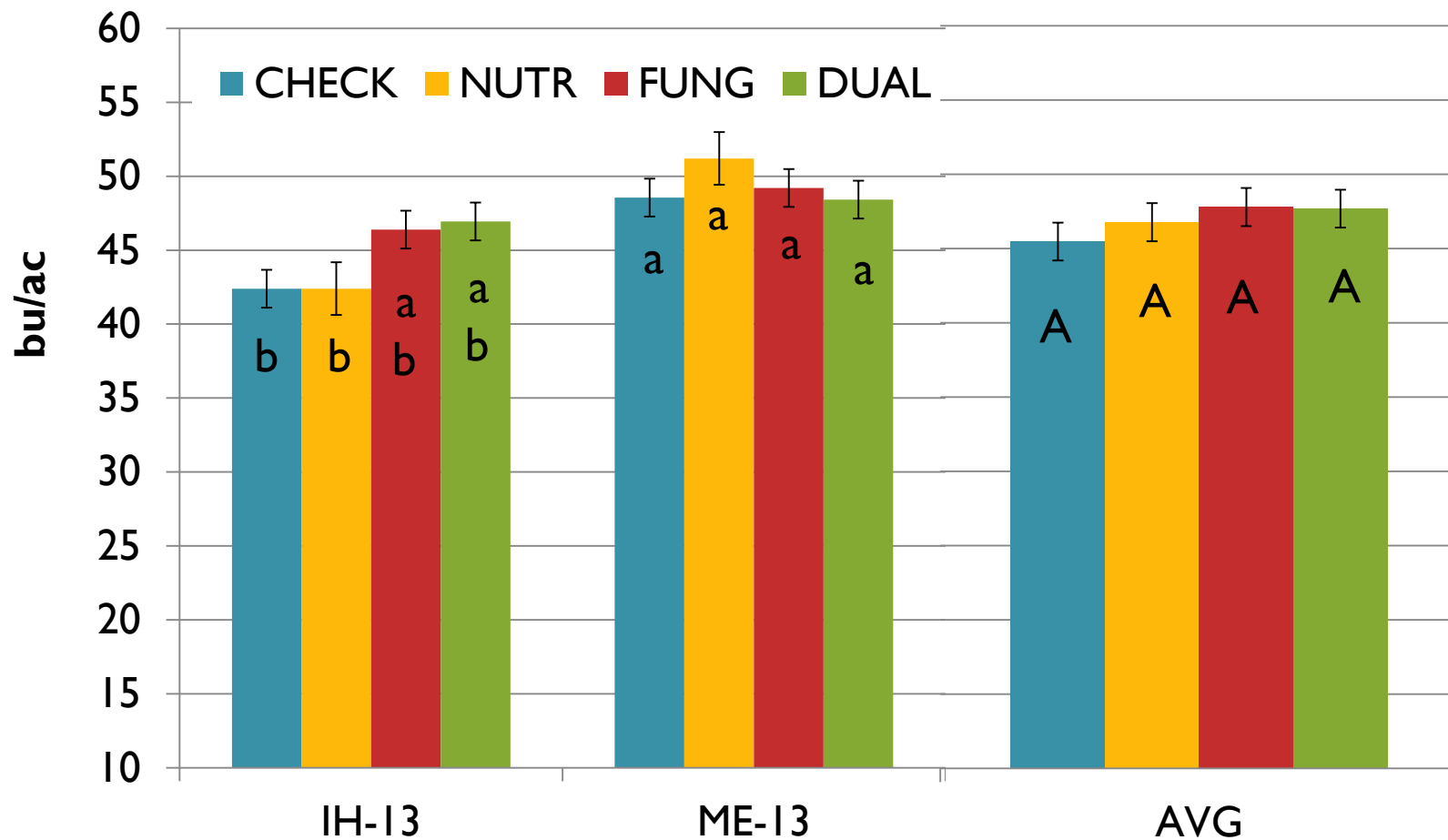
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Seed Treatment Effects on Flax Emergence



Seed Treatment Effects on Flax Yield



Take Home Messages

- Do not treat flax as a low input crop & expect consistent top yields
- Many competitive varieties available – refer to 2015 Seed Guide
- Flax generally performs best on cereal or pulse stubble – avoid canola stubble whenever possible
- Seed early in May for earlier harvest and optimum yields – but flax seeded at the end of May should perform well under most conditions
- Flax responds well to fertilizer when residual levels are low but does best in fields with high residual P – limit or avoid seed placement of all fertilizer to avoid seedling injury, consider S when residual levels are potentially low
- Buctril M or Curtail M for general broadleaf weed control – Authority good for full-season control of weeds such as cleavers, wild buckwheat & kochia
- Where pasmo is present, Headline application usually pays for itself & can greatly improve yields under high disease pressure
- Pre-harvest glyphosate may be beneficial if green weeds are present
- Flax is typically harvested after cereals, canola and most pulses – hard frost often terminates the crop and it weathers well compared to many others

THANK YOU



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