

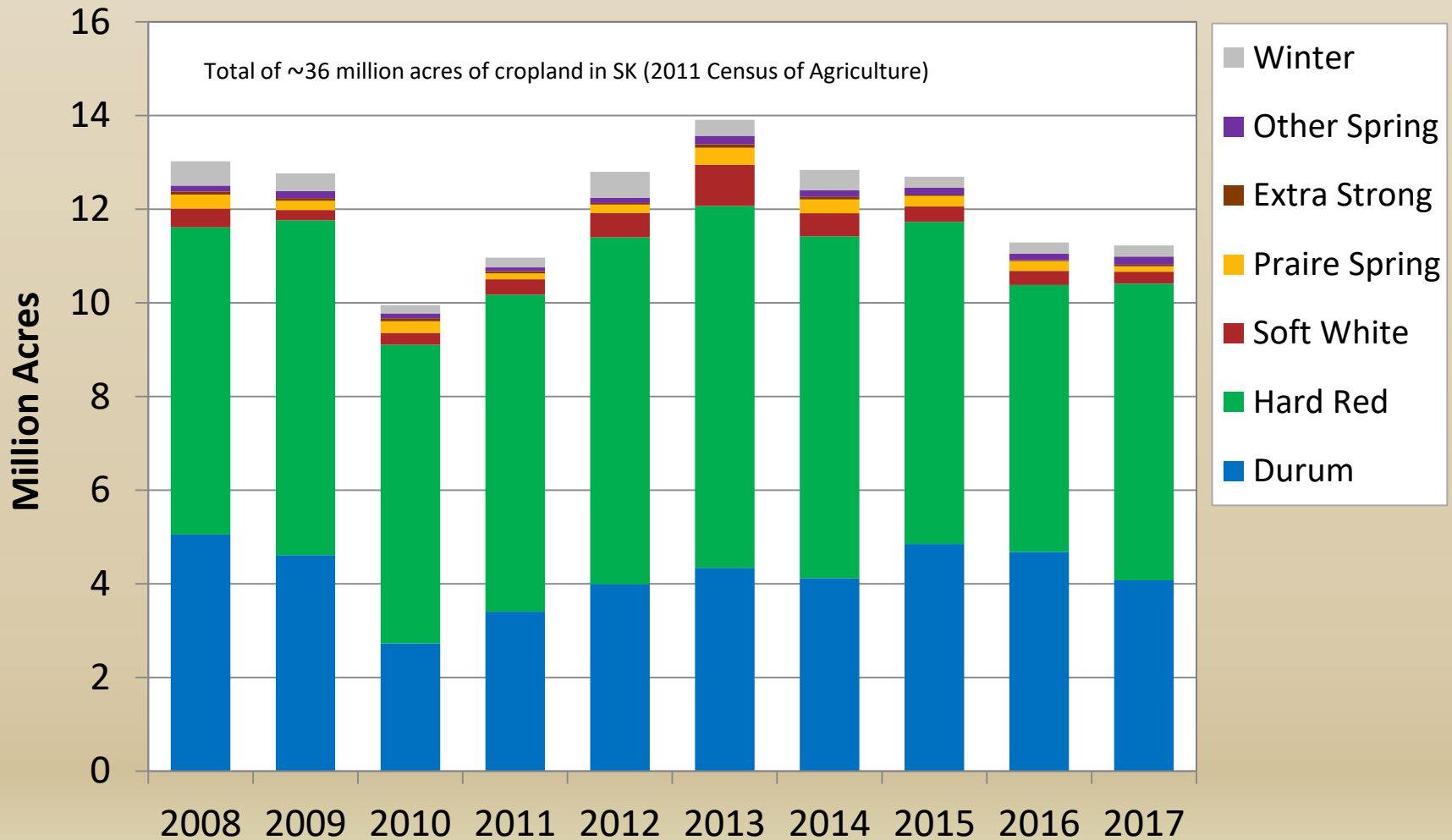
Addressing Local Wheat Production Challenges with Applied Agronomic Research

Chris Holzapfel, MSc PAg



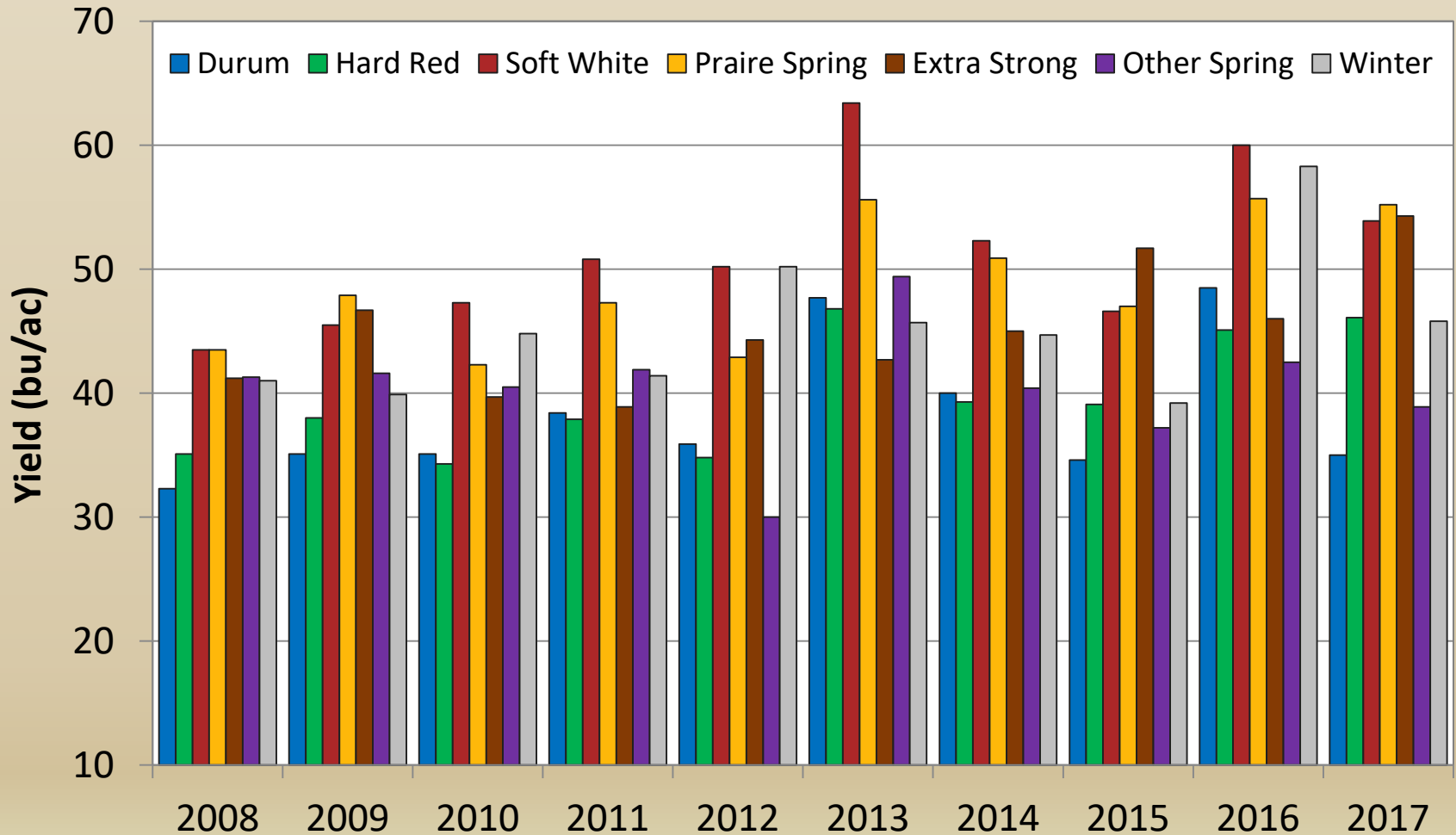
Saskatchewan Wheat by Class

Harvested Acres (2008-17)



Saskatchewan Wheat by Class

Provincial Average Yields (2008-17)



Major Wheat Production Issues in Southeast Saskatchewan

- Wheat is among the most economically & rotationally important SK crops but is not without production challenges
- Specific challenges vary with environment (i.e. weather) & across classes but a few broader & important agronomic issues frequently encountered in SE Saskatchewan include:
 1. **Lodging:** Can cost yield, reduce harvest efficiency & often influences variety, fertility & seeding rate decisions
 2. **Protein:** Important quality parameter for hard red & durum wheat, largely dictated by weather but also managed through variety selection & N management
 3. **Disease:** Primarily leaf spot & fusarium head blight, bigger problem in wet years, potential to reduce both yield & quality, can result in major economic loss or even unmarketable grain in severe cases

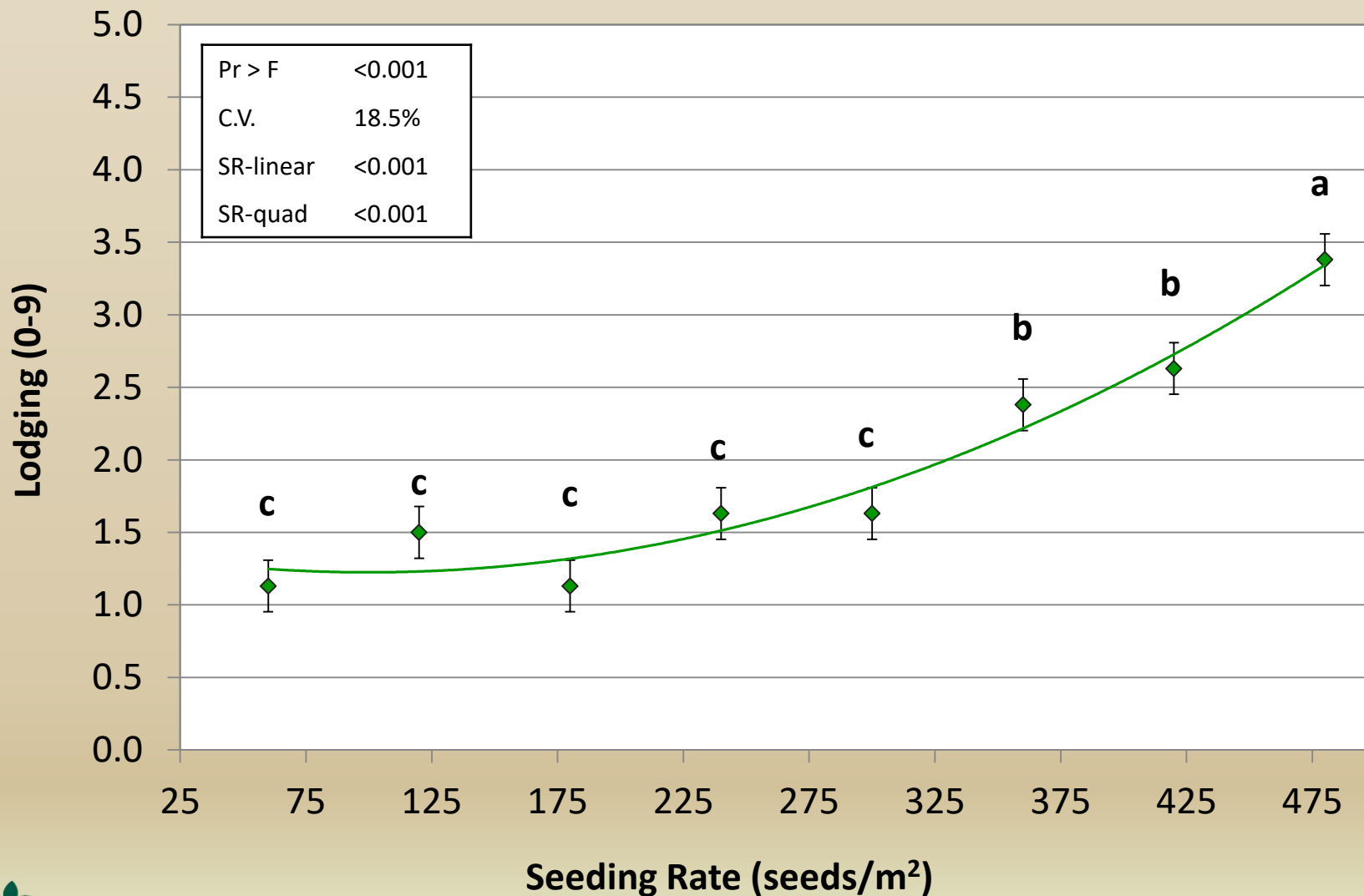


Production Challenge #1: Lodging



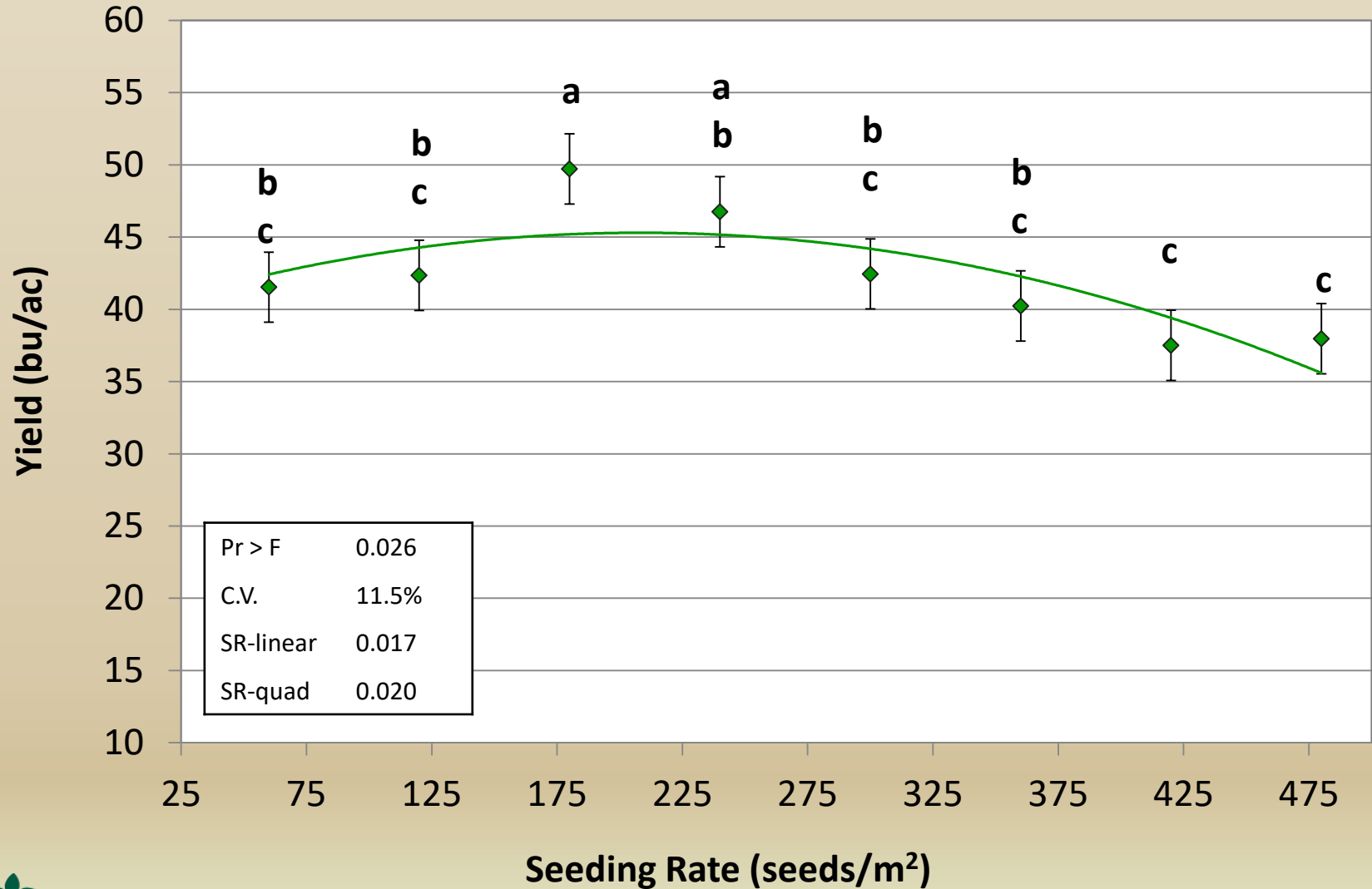
Wheat Seeding Rate Demo: Lodging

Indian Head 2012 (ADOPT)

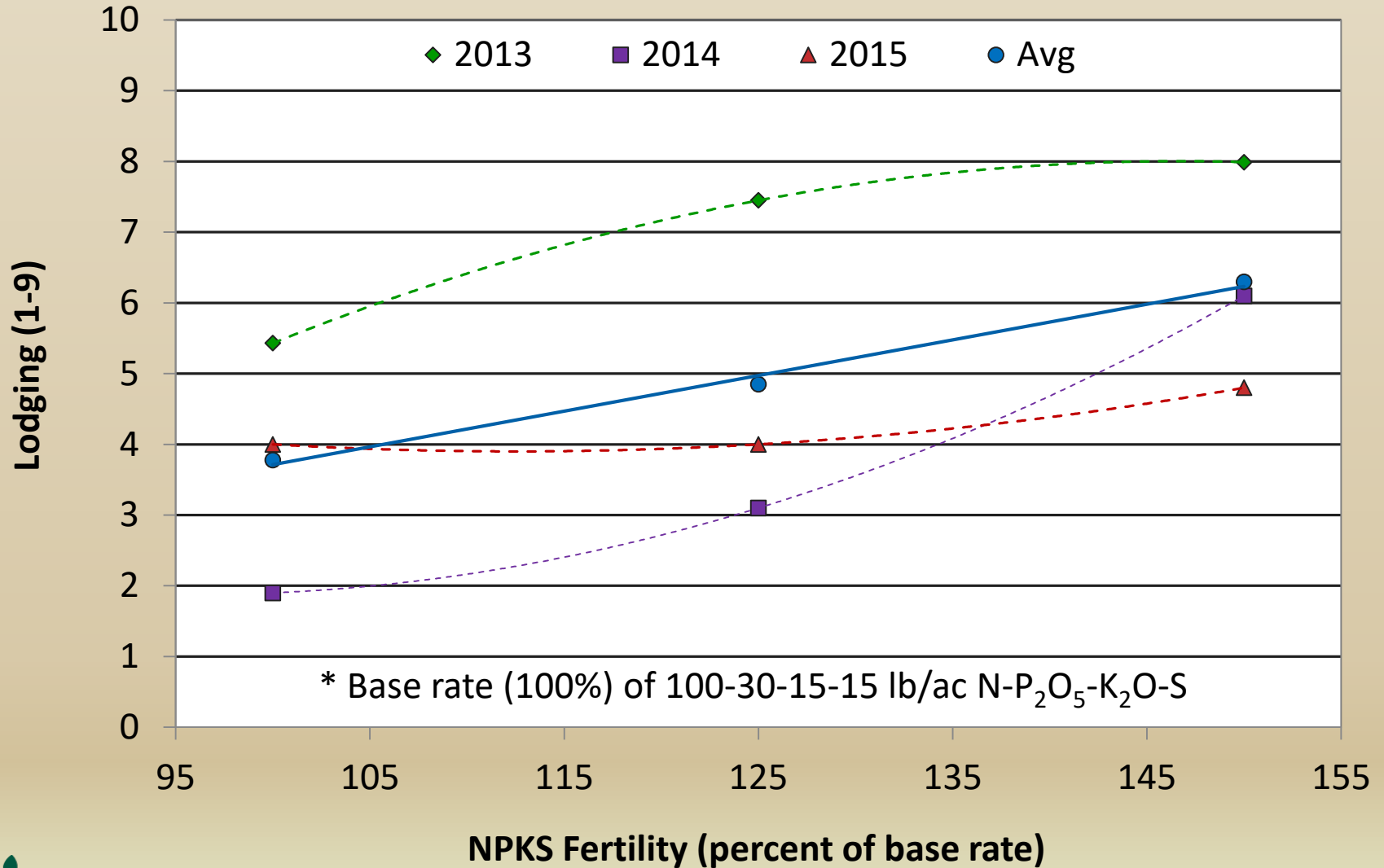


Wheat Seeding Rate Demo: Yield

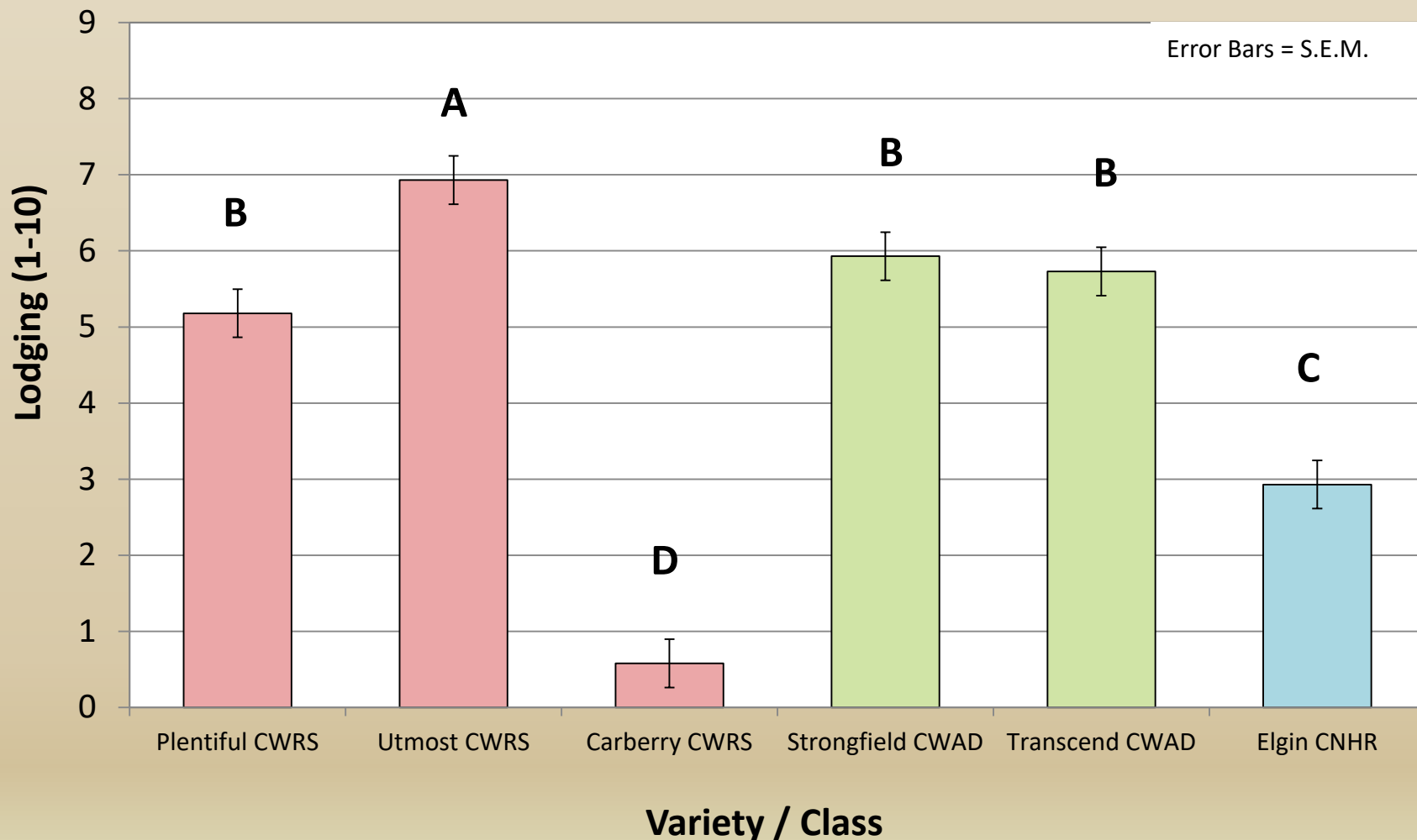
Indian Head 2012 (ADOPT)



Fertility Effects on Lodging in Wheat Indian Head 2013-15 (Engage Agro)



Variety Selection to Mitigate Lodging Indian Head 2016 (Engage Agro)



PGR Effects Across Varieties & Classes

Indian Head 2016-17

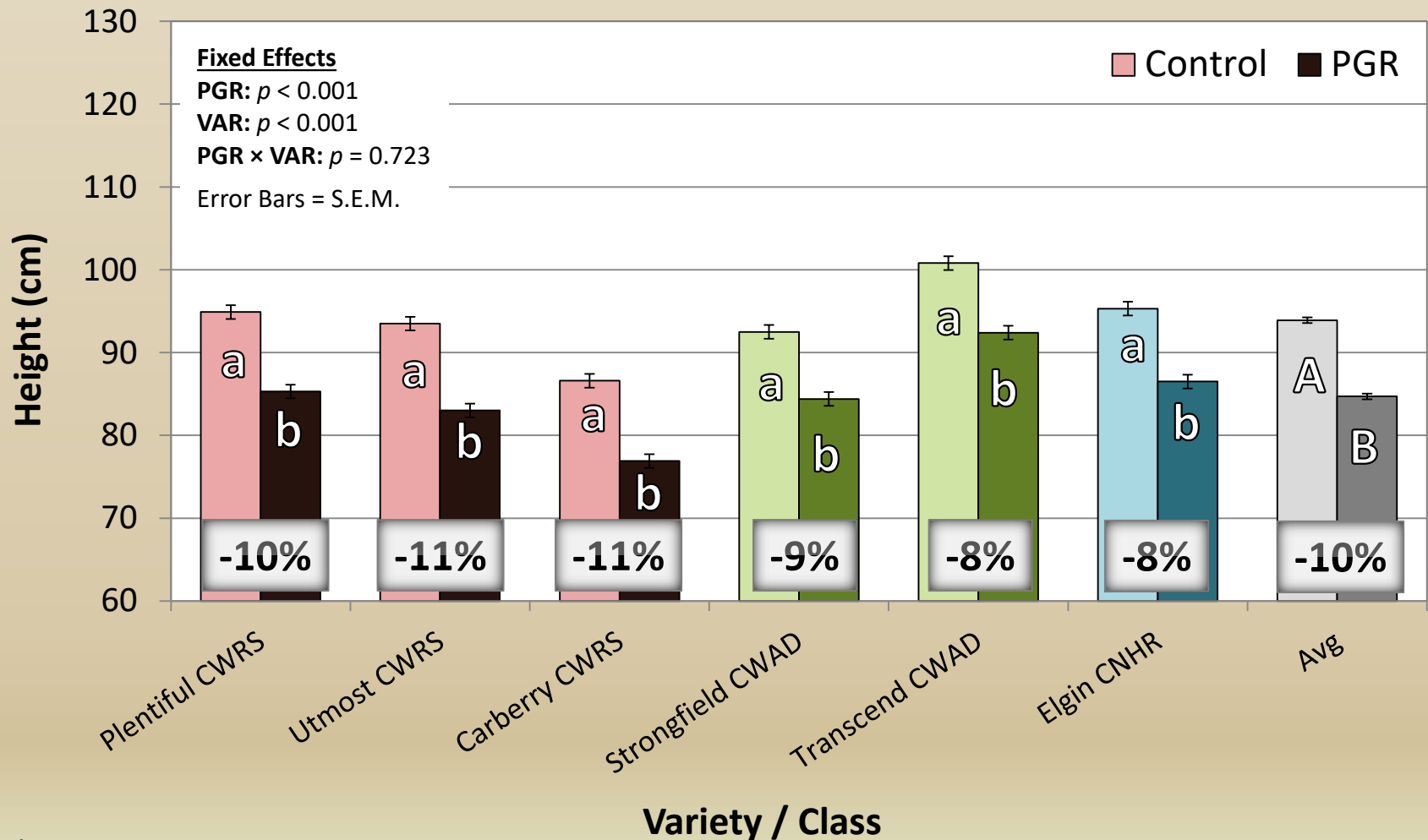
Objectives: To investigate differences amongst wheat varieties & classes in responsiveness to Manipulator

- 6 varieties across 3 classes (CWRS, CNHR & CWAD), varieties varied from year-to-year
- 350 seeds/m² seeding rate, 125-36-18-18 lb/ac N-P₂O₅-K₂O-S, foliar fungicide applied at both T2 & T3
- Wet with heavy lodging & disease pressure in 2016, much drier in 2017 with very little lodging but high yield potential
- Targeted GS31-32 for treatment application



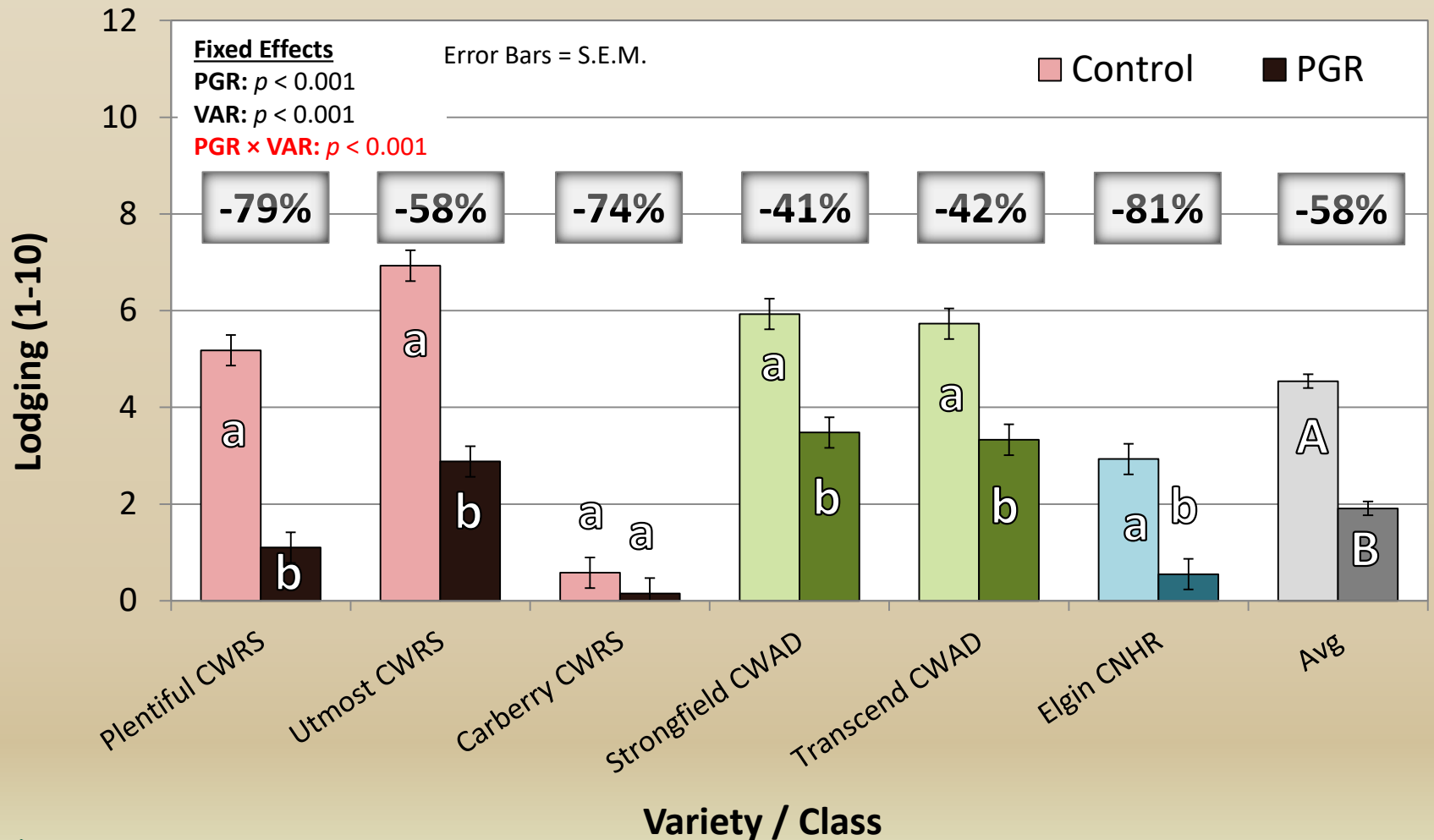
PGR x Variety – IH 2016 (wet)

Effects on Plant Height



PGR x Variety – IH 2016 (wet)

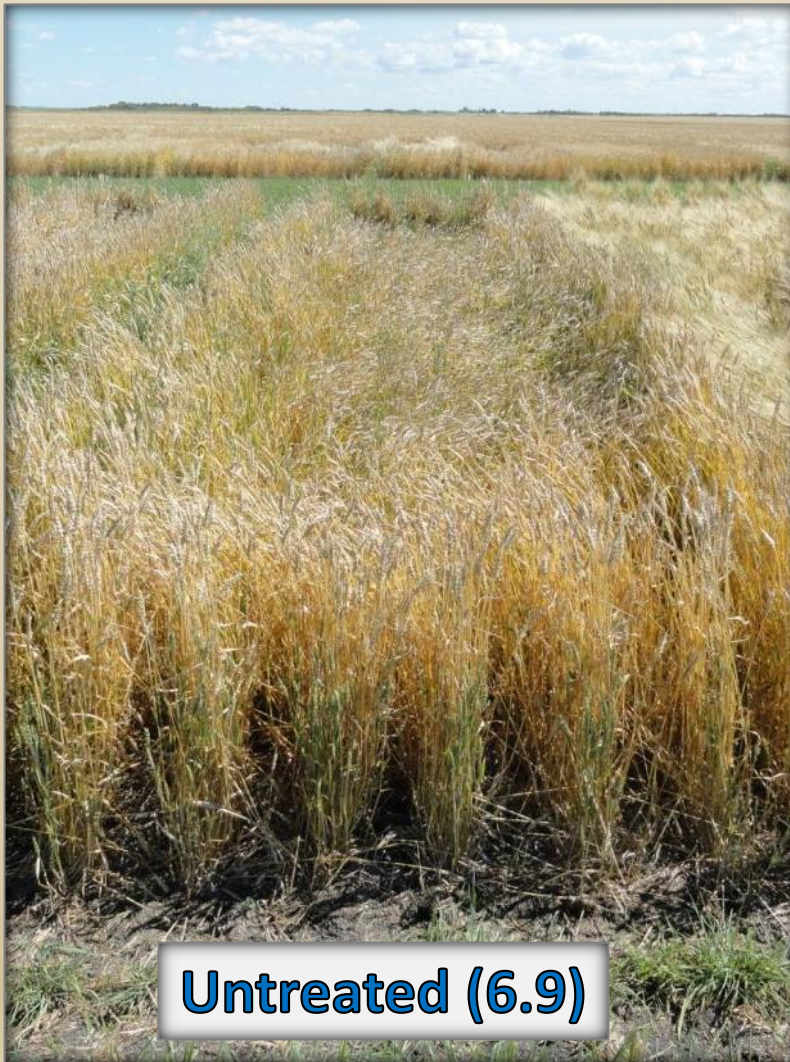
Effects on Lodging



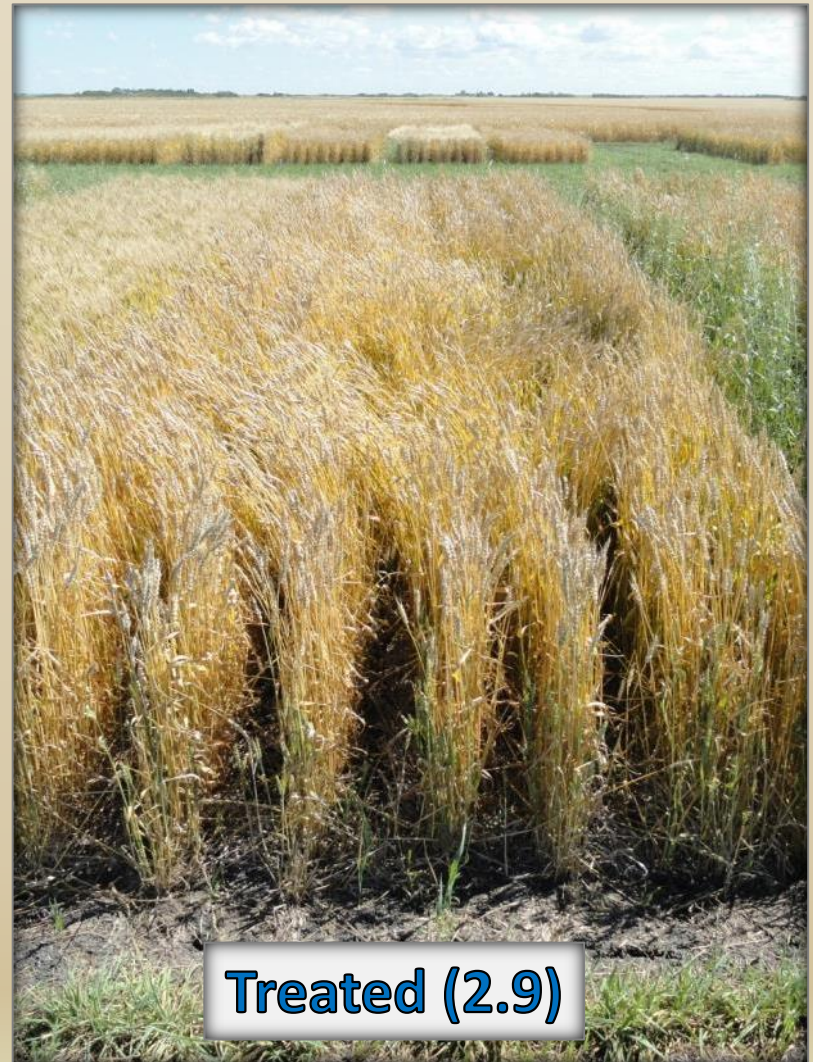
AC Carberry – August 18, 2016



CDC Utmost VB – August 18, 2016



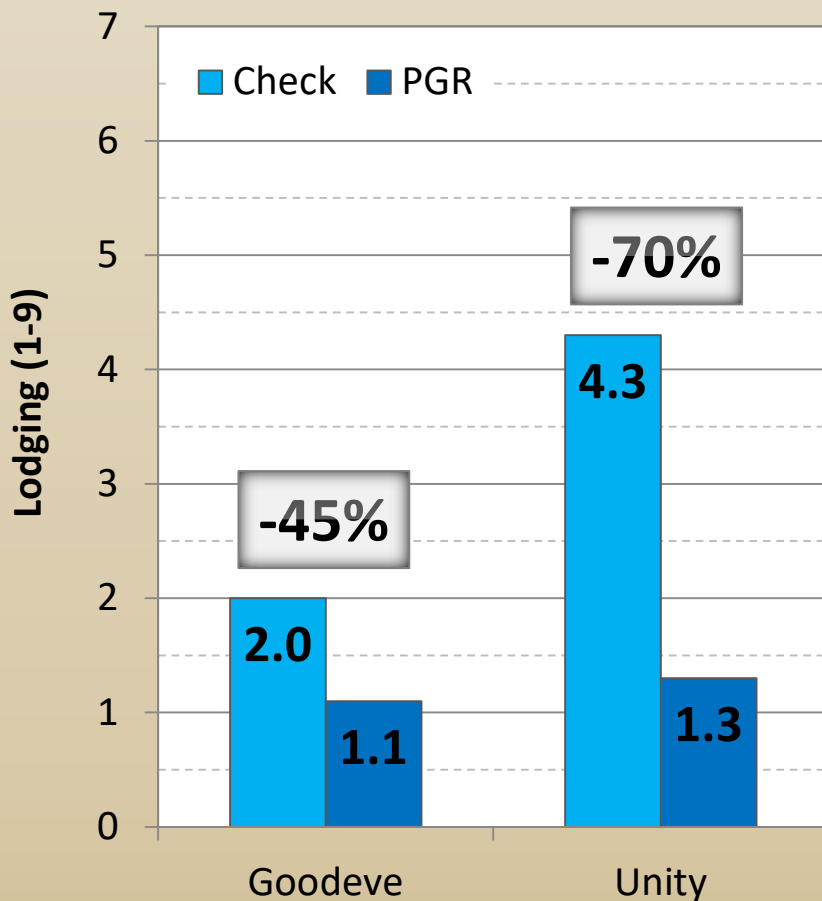
Untreated (6.9)



Treated (2.9)

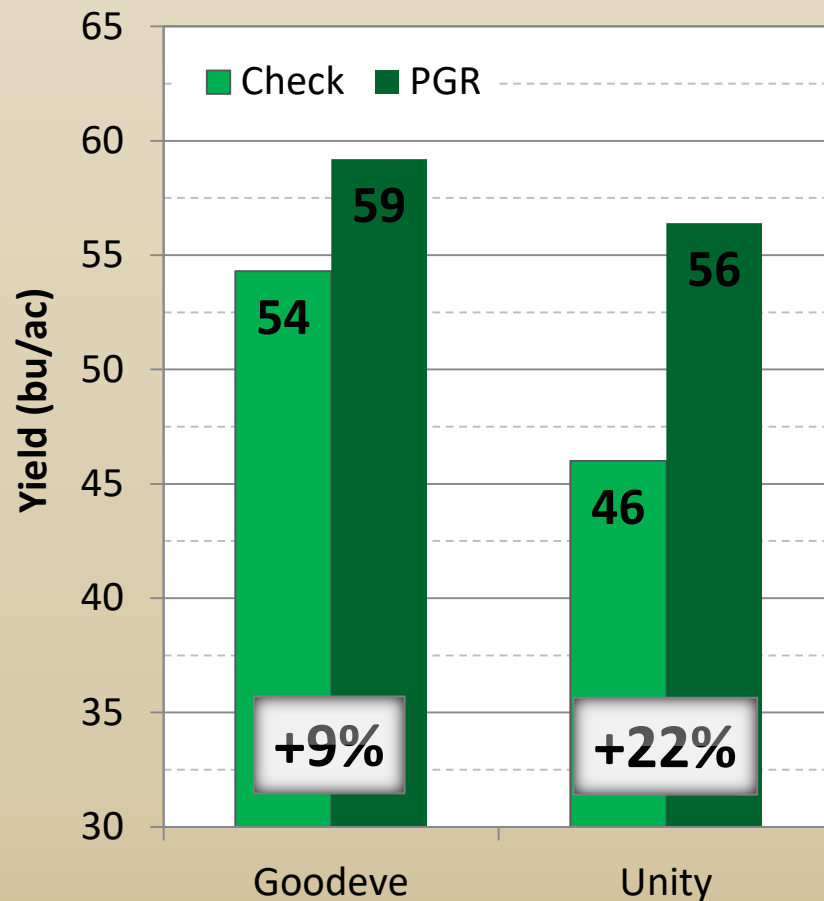
PGR × Variety at Yorkton 2015

Effects on Lodging



PGR Timing

Effects on Grain Yield



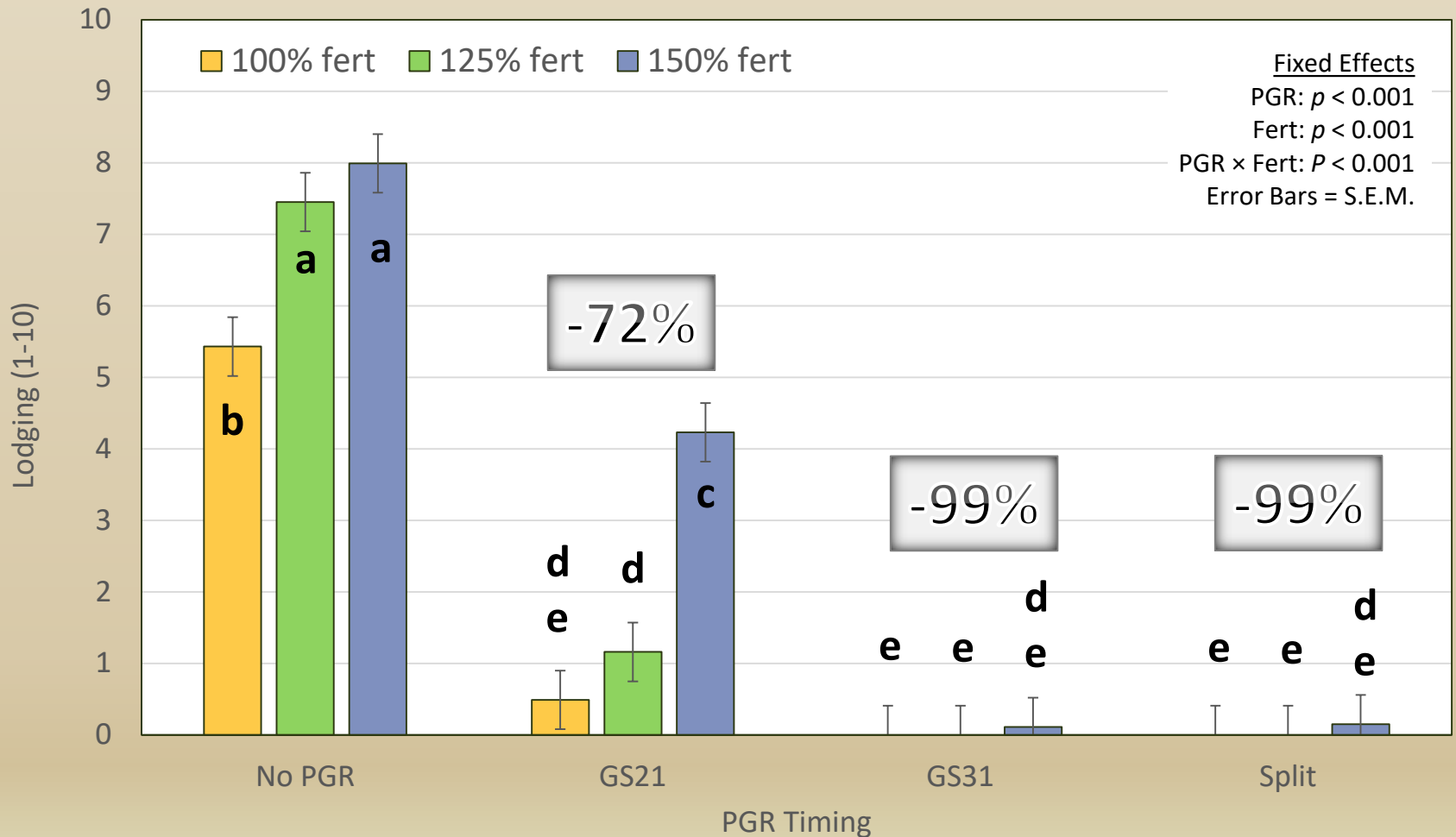
PGR Timing

Application Time & Overall Fertility Effects on Wheat Response to PGR

- Field trials conducted in 2013, 2014, & 2015 at Indian Head
 - Similar trials at Melfort (NARF), Scott (WARC) & Yorkton (ECRF)
 - Variety was Unity VB with a 275 seeds/m² seeding rate
- **Fertilizer rates** were 100, 125 & 150% of a base rate of 112-34-14-17 kg/ha N-P₂O₅-K₂O-S
- **PGR Timing – 0.73 l/ac Manipulator applied at:**
 - None - control
 - Zadoks GS 21 – 1st tiller
 - Zadoks GS 31 – 1st node detectable
 - Split 21 + 31 – half rate each time (2013 only)
 - Zadoks 39 – early flag (2014 & 2015 only)

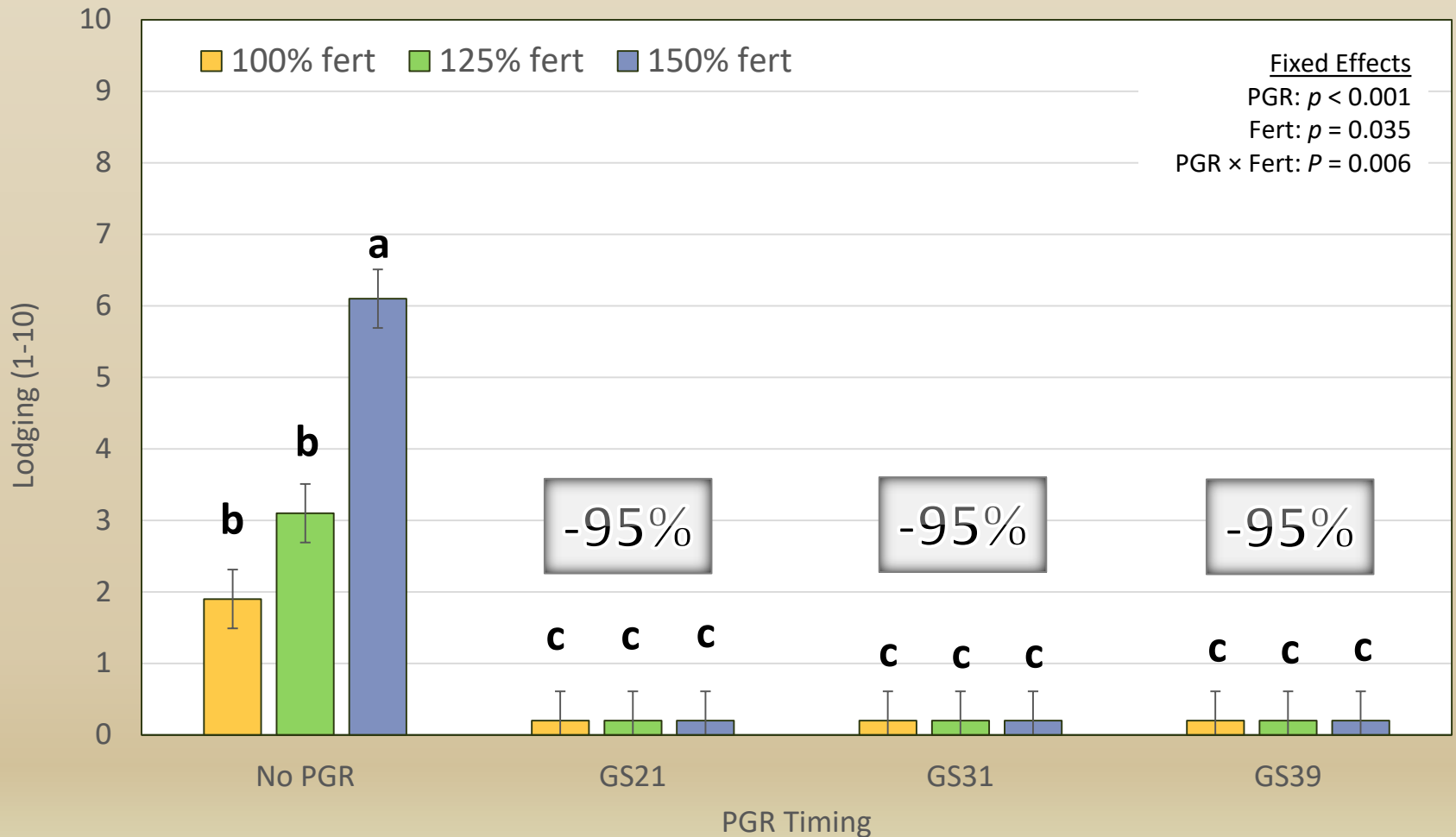
Indian Head 2013

PGR Timing & Fertility Effects on Lodging



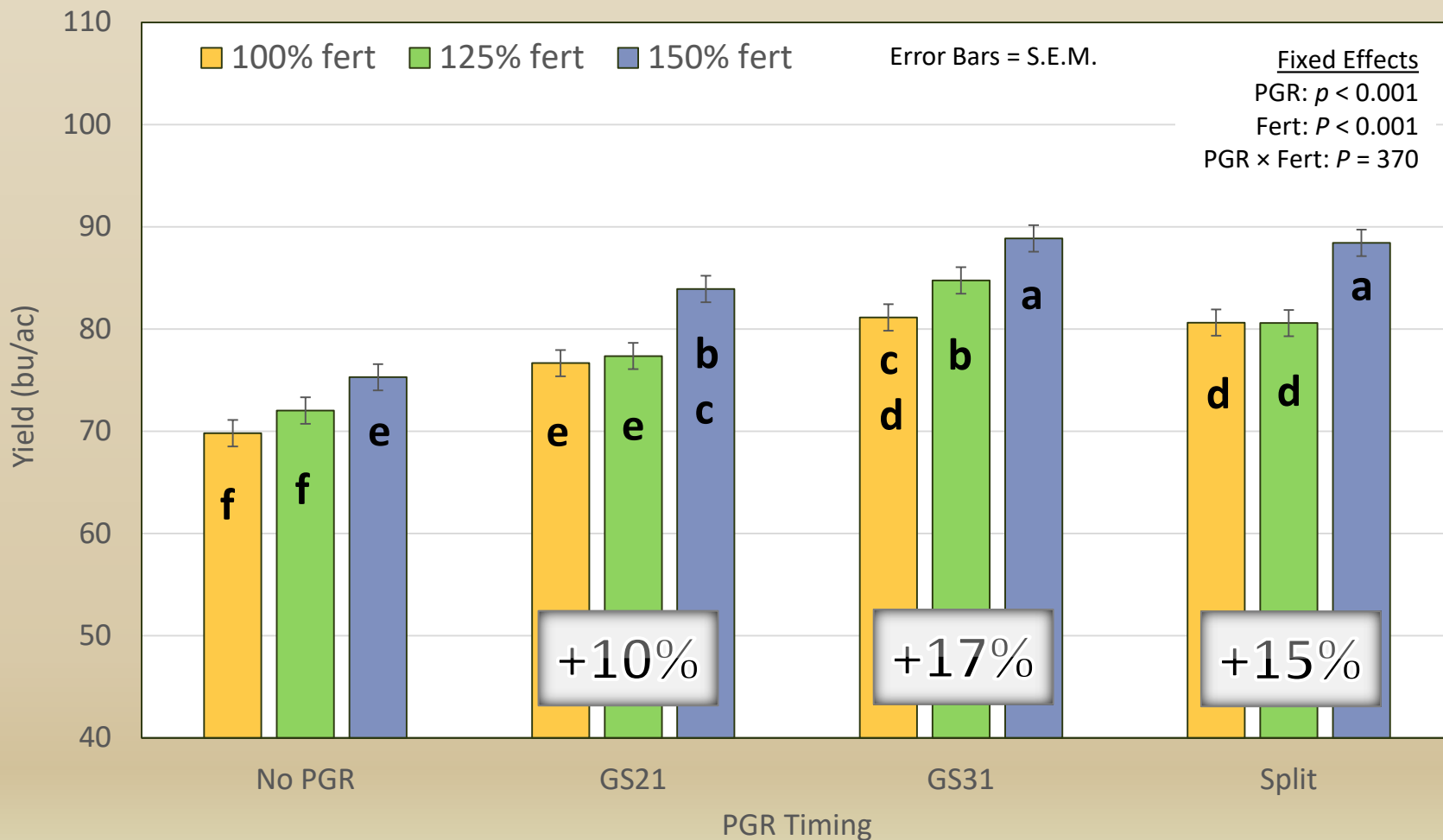
Indian Head 2014

PGR Timing & Fertility Effects on Lodging



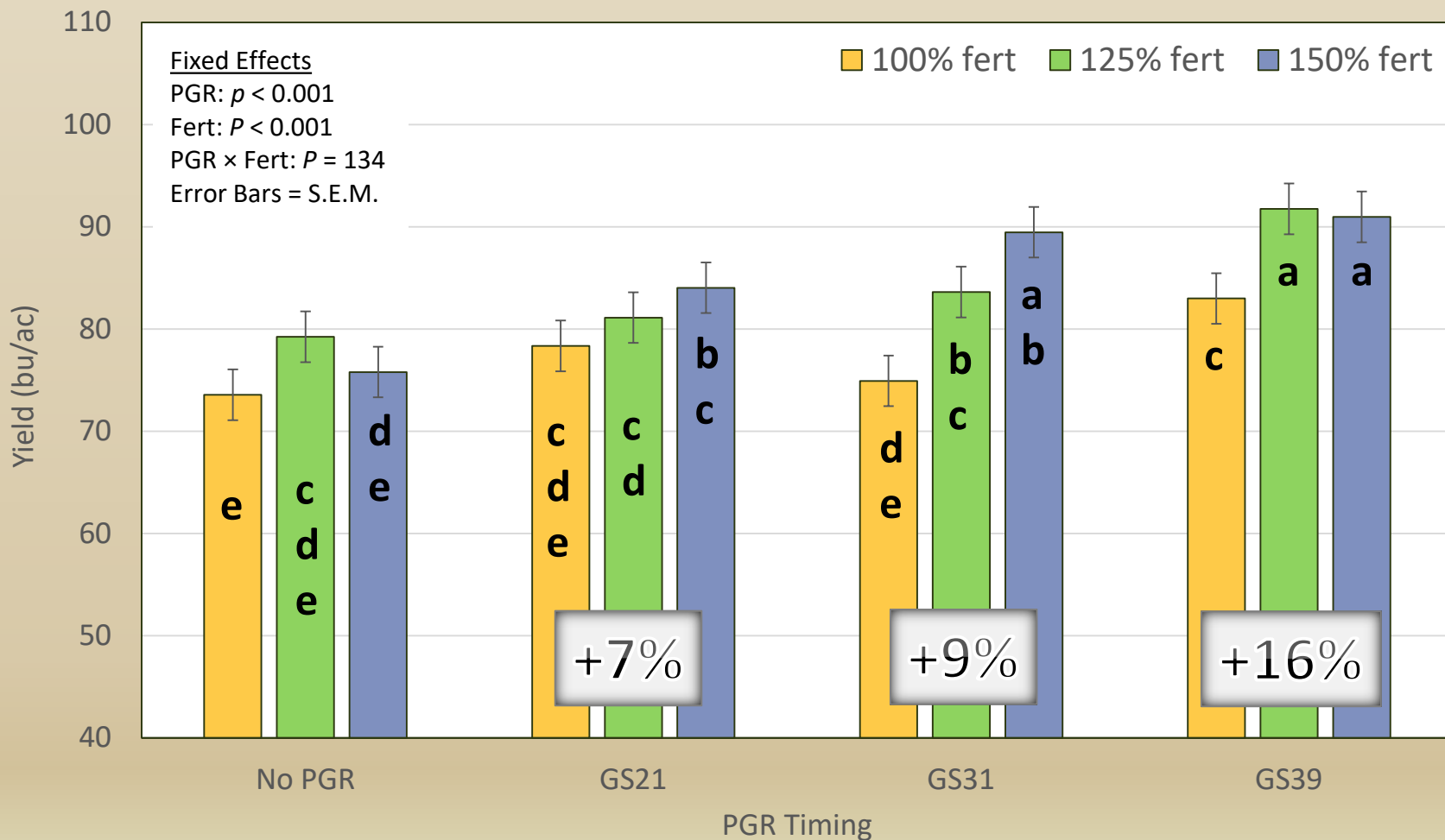
Indian Head 2013

PGR Timing & Fertility Effects on Yield

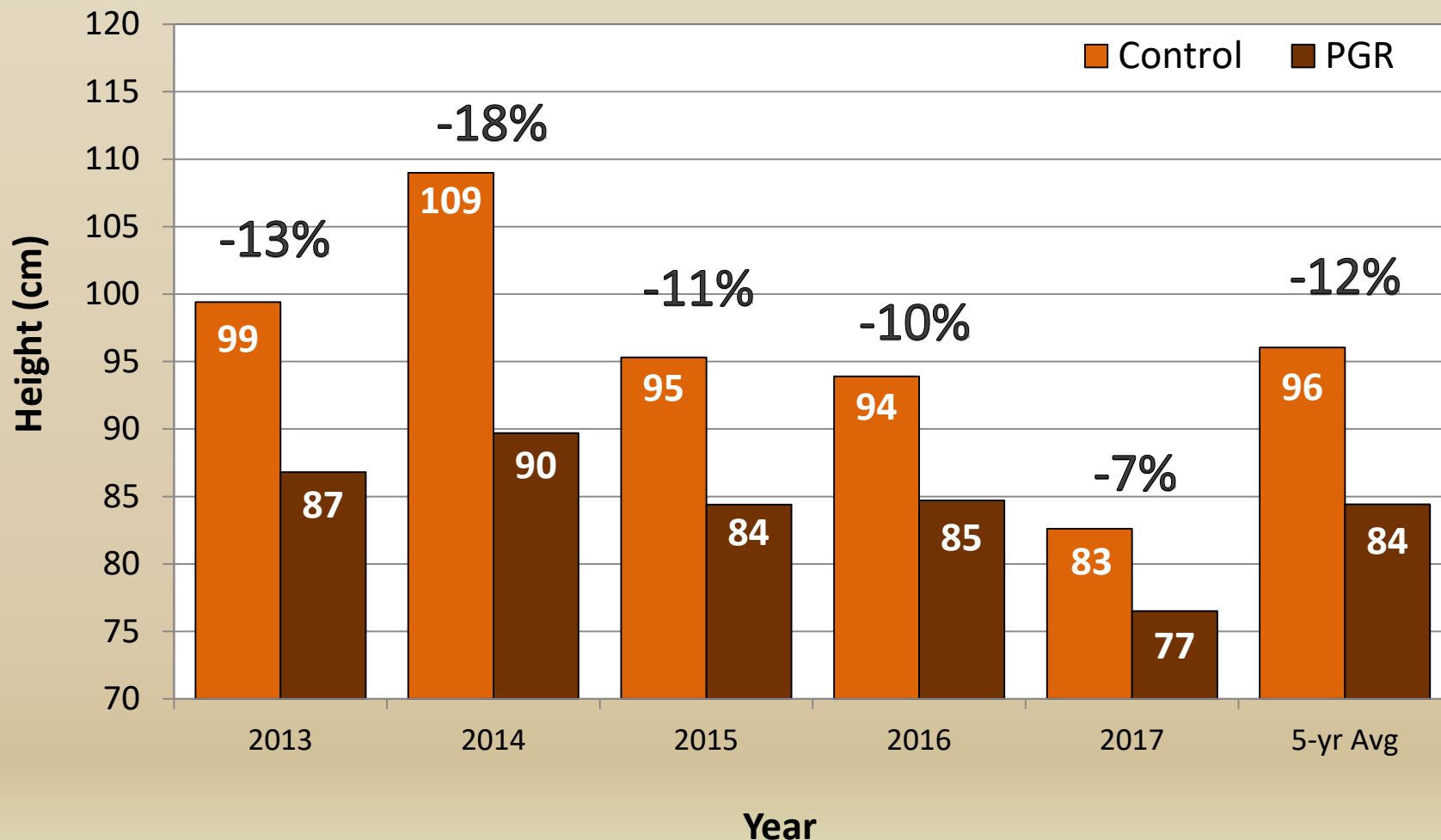


Indian Head 2014

PGR Timing & Fertility Effects on Yield

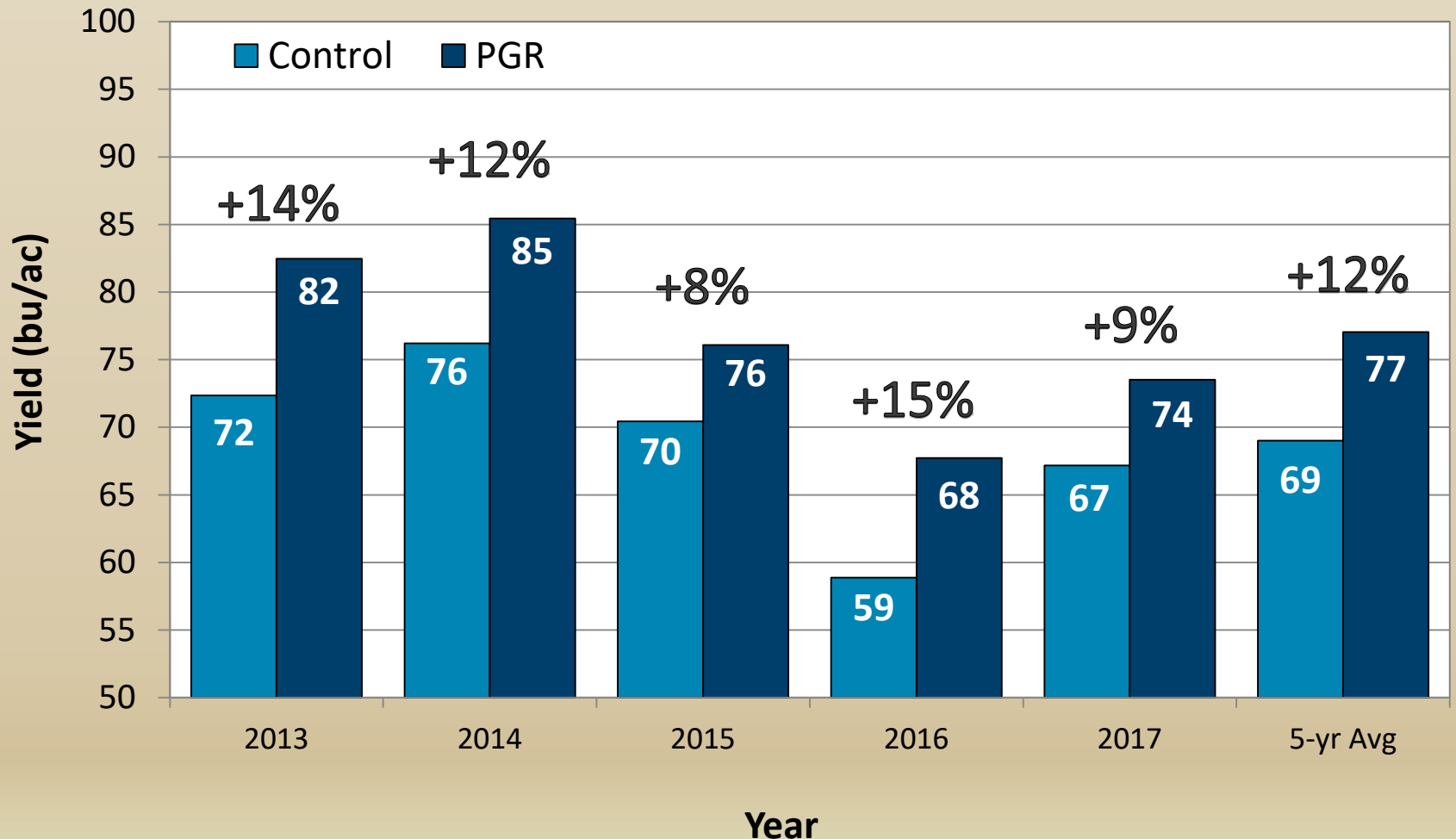


PGR Effects on Wheat Height Indian Head 2013-2017



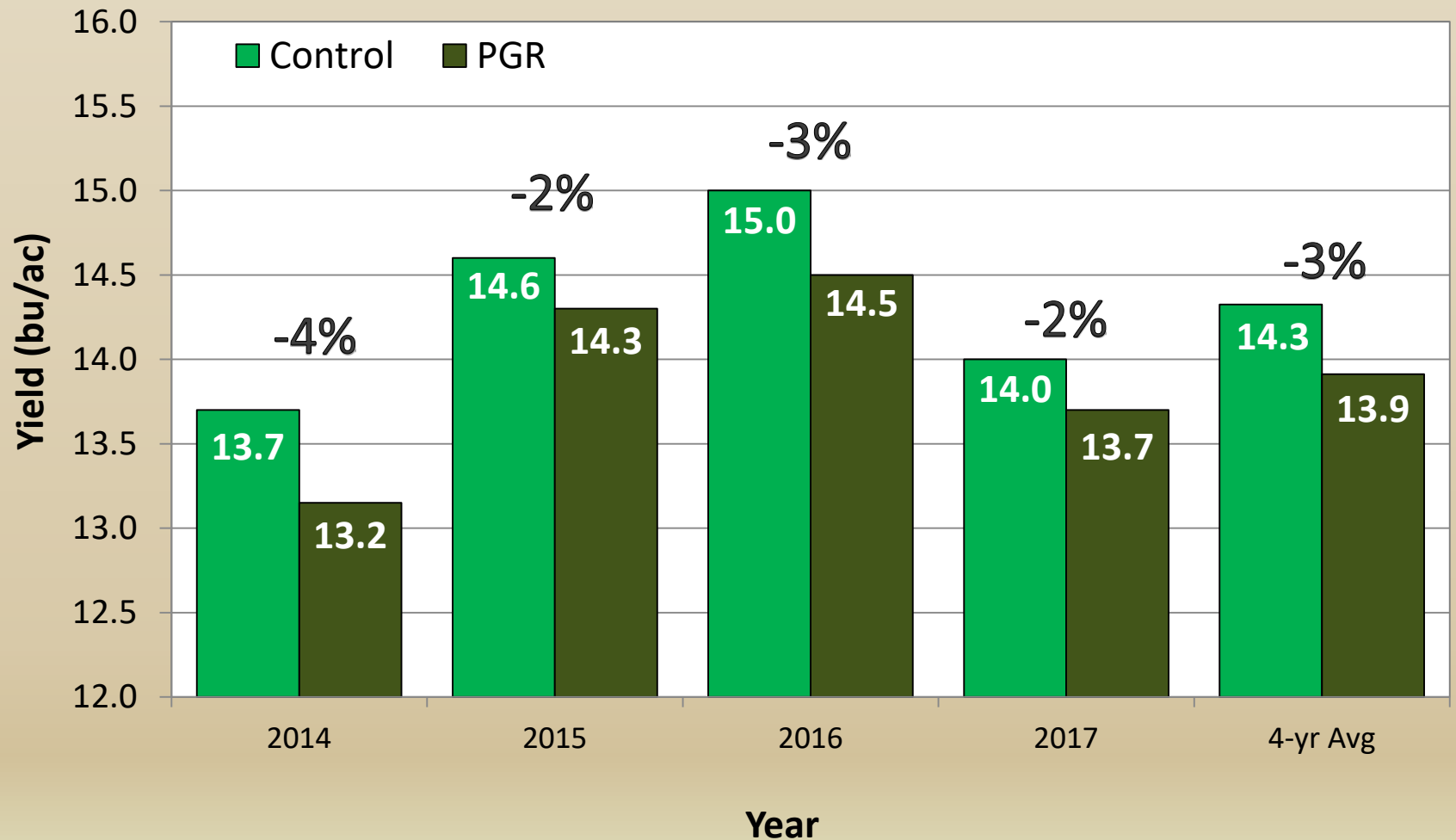
PGR Effects on Wheat Yield

Indian Head 2013-2017



PGR Effects on Wheat Protein

Indian Head 2013-2017



Production Challenge #2: Protein



Controlled Release N for Yield & Protein

Indian Head 2015

Objectives: To compare the effects of several (side-banded) controlled release N fertilizer product blends on wheat lodging, yield, & protein

#	Form	Rate (lb N/ac)
1	N/A	N/A
2	100% Urea (untreated)	67
3	50% ESN	67
4	75% ESN	67
5	50% SuperU	67
6	75% SuperU	67
7	100% Urea (untreated)	125
8	50% ESN	125
9	75% ESN	125
10	50% SuperU	125
11	75% SuperU	125

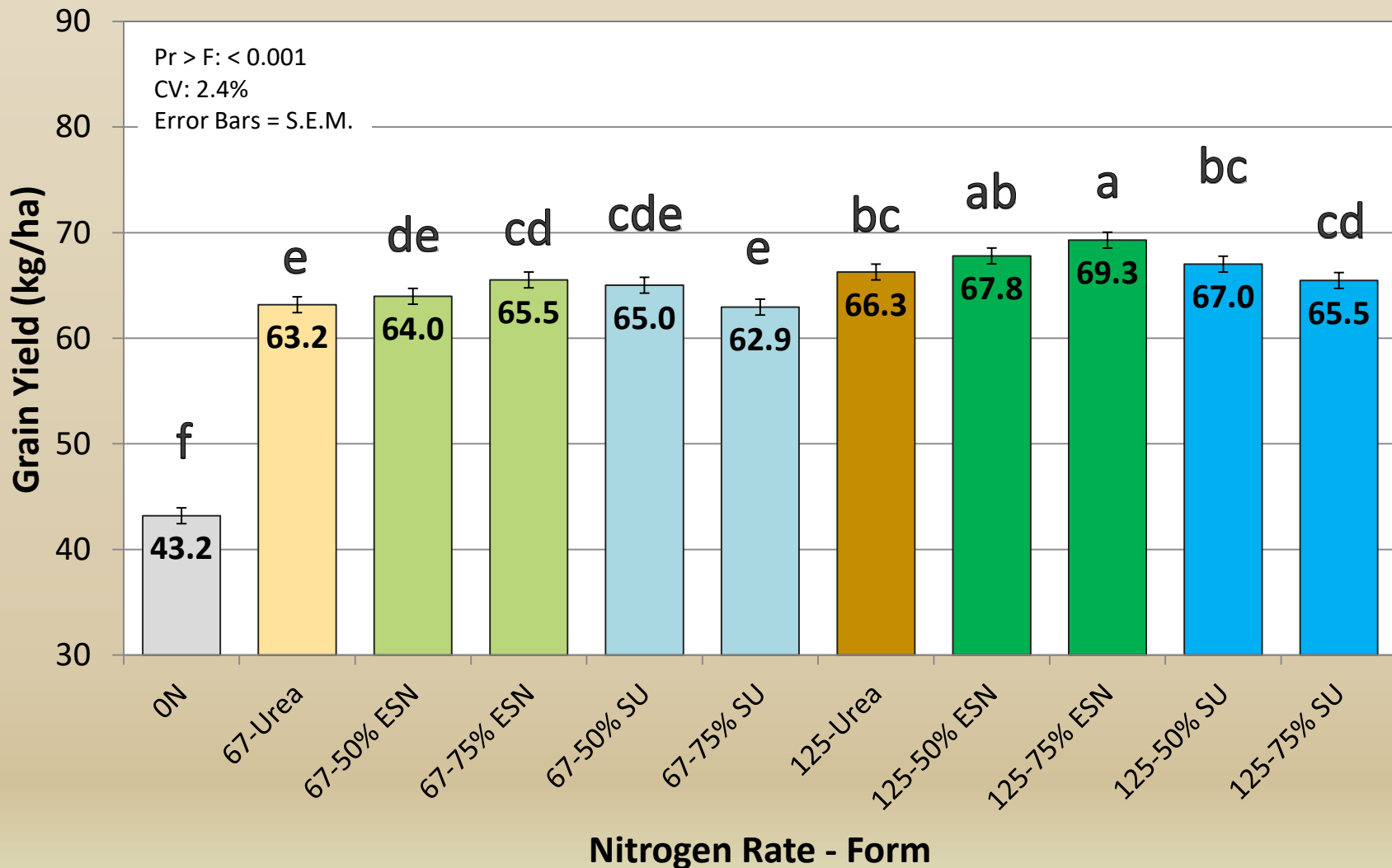


* All Nitrogen Side-banded at Seeding (SeedMaster, 12" spacing)

**23 lb NO₃-N soil residual N (early spring sample)

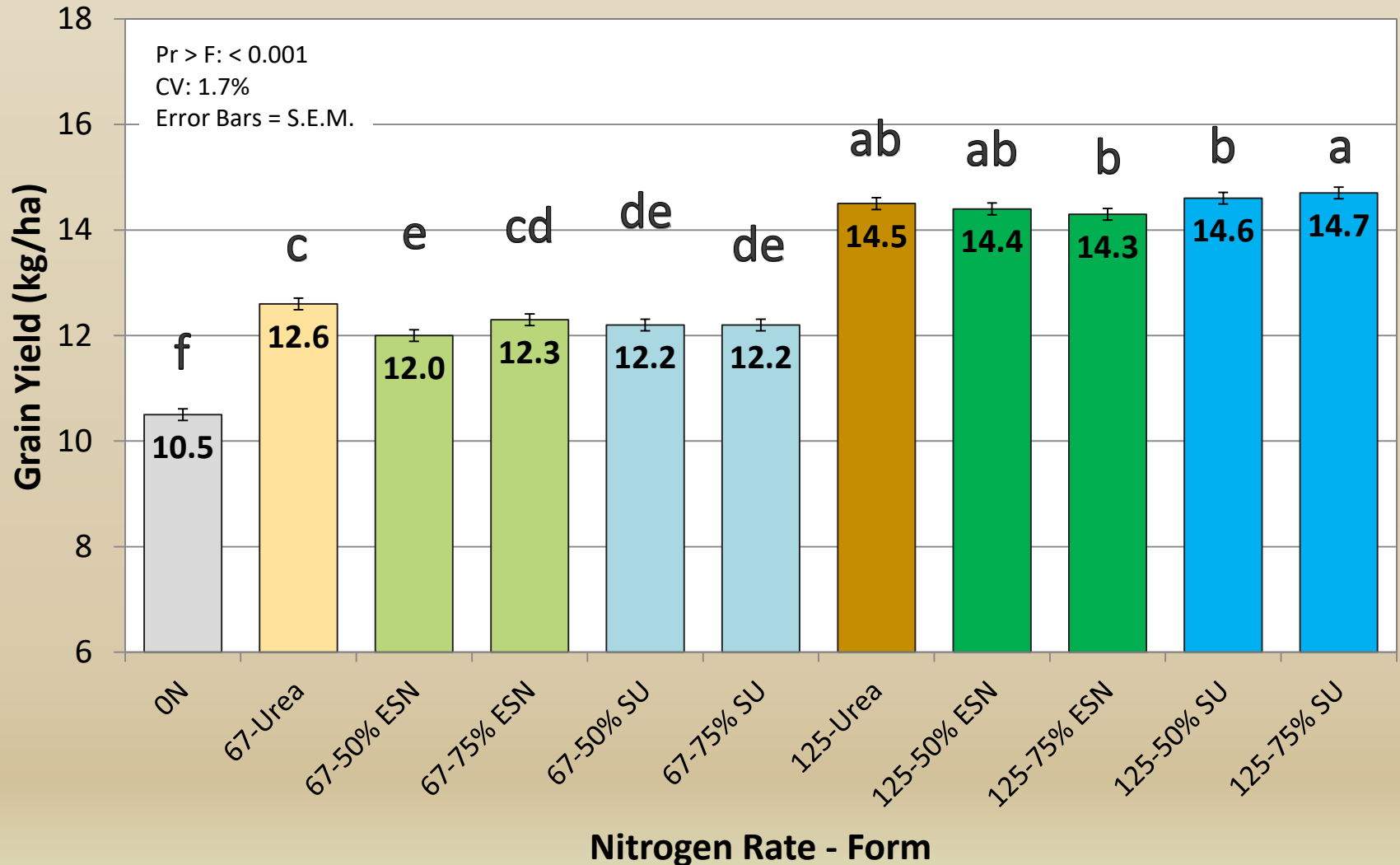
N Rate & Form: Effects on Yield

Indian Head 2015



N Rate & Form: Effects on Protein

Indian Head 2015



4R N Management in Canola & Wheat

Indian Head 2017

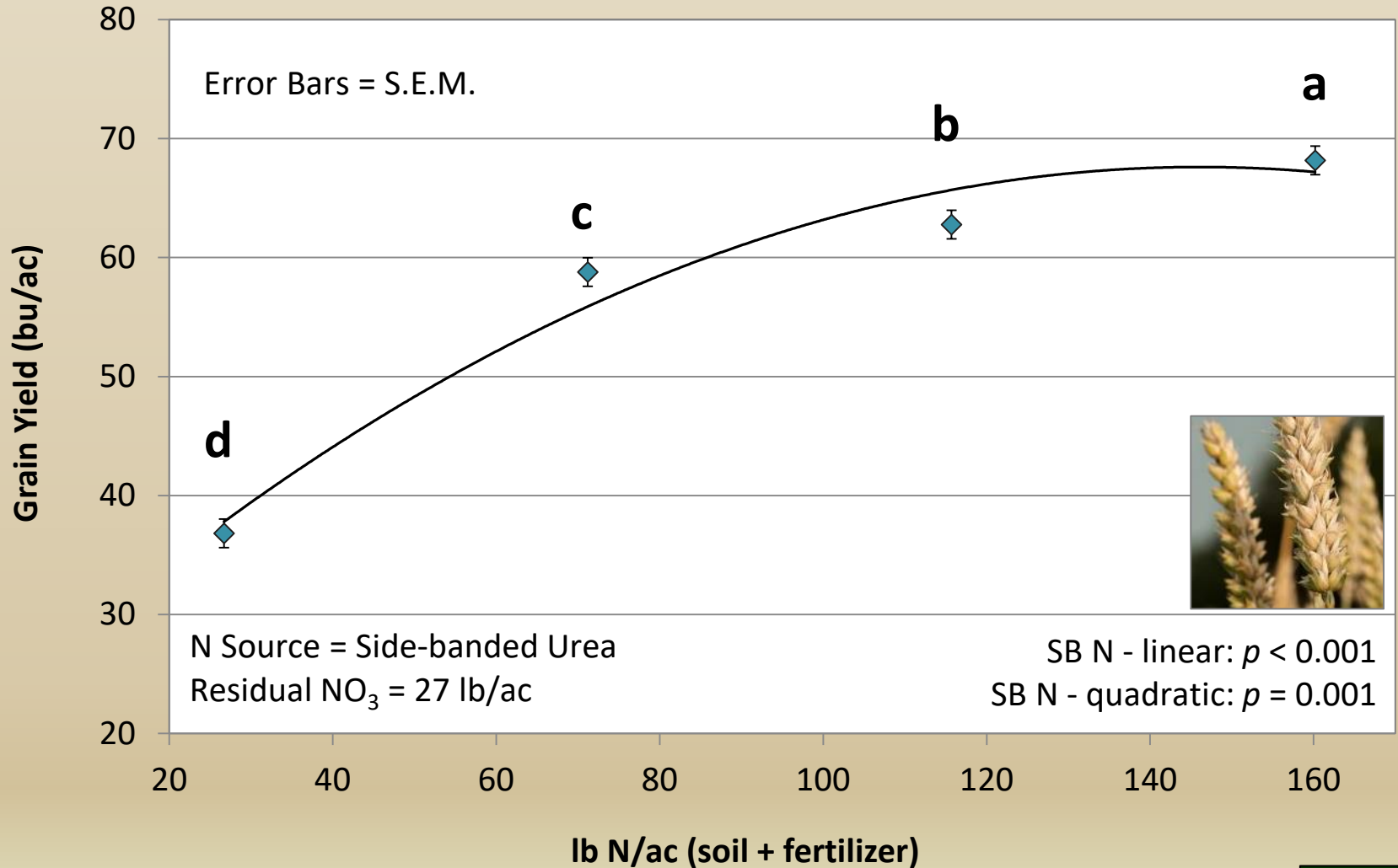
Objectives: To demonstrate crop response to varying rates of N along with different forms, timing & placement relative to side-banded, untreated urea

#	Form	Timing / Placement	Rate *
1	N/A	N/A	N/A
2	Urea (untreated)	Side-band (during seeding)	0.5x
3	Urea	Side-band (during seeding)	1.0x
4	Urea	Side-band (during seeding)	1.5x
5	Urea	Pre-seed surface broadcast	1.0x
6	Urea Ammonium-Nitrate (UAN)	Pre-seed surface dribble-band	1.0x
7	Agrotain® (AT)	Pre-seed surface broadcast	1.0x
8	SuperUrea® (SU)	Pre-seed surface broadcast	1.0x
9	Urea / Urea	50:50 Split Application ^Y	1.0x
10	Urea / UAN	50:50 Split Application	1.0x
11	Urea / Agrotain®	50:50 Split Application	1.0x
12	Urea / SuperUrea®	50:50 Split Application	1.0x

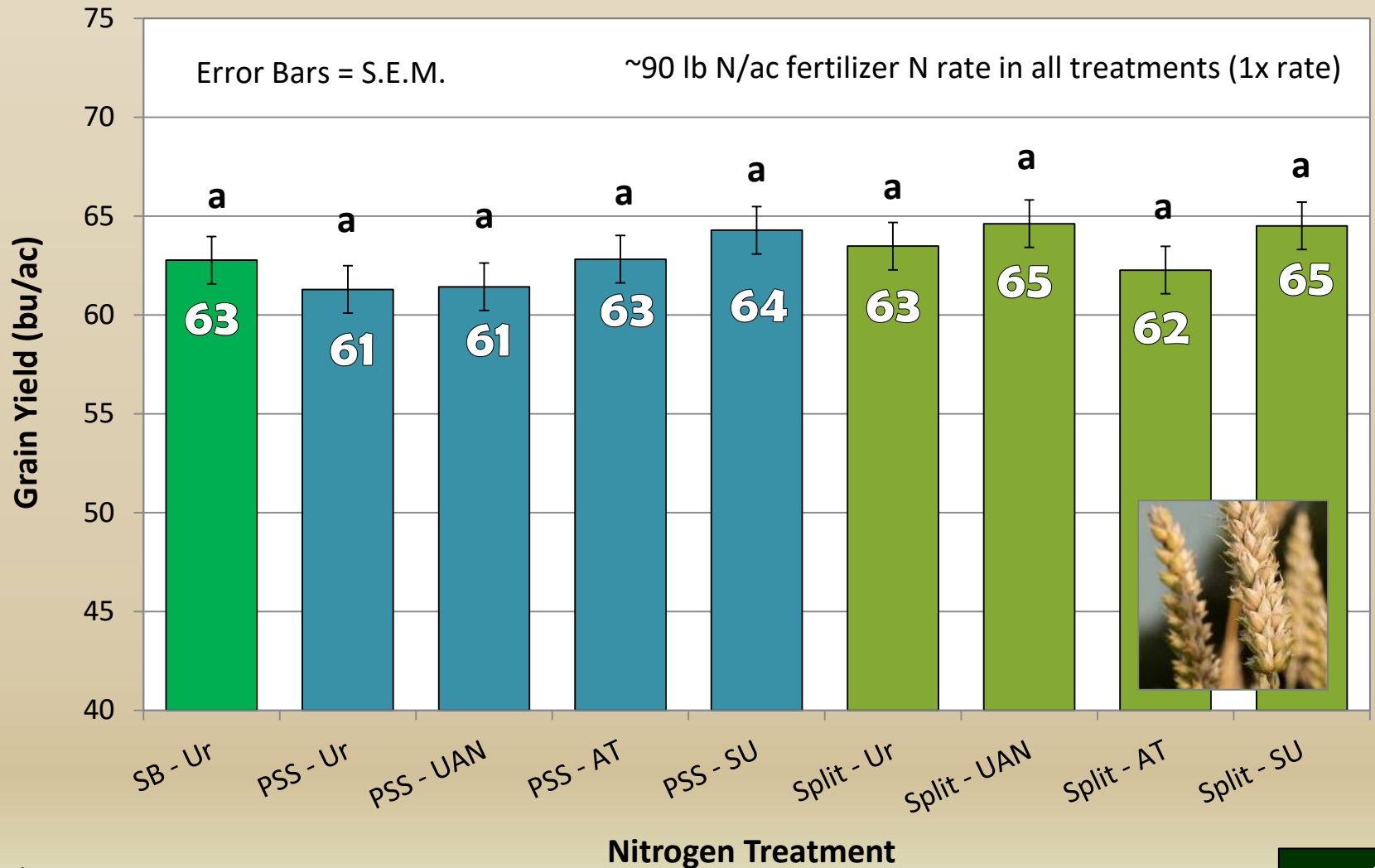
** 1x = 116 lb total N/ac (soil + fertilizer)

N Rate Effects on Wheat Grain Yield

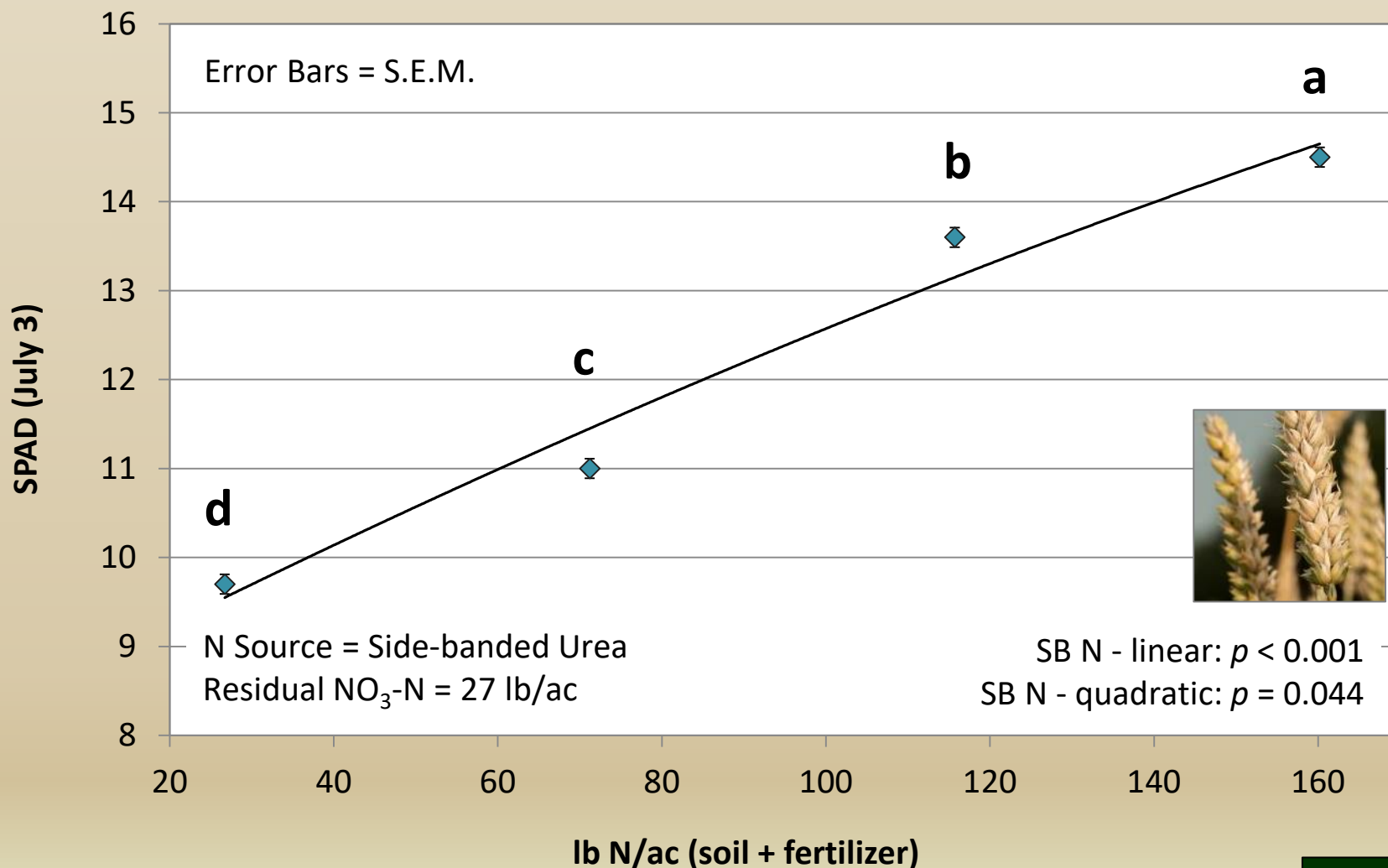
Indian Head 2017



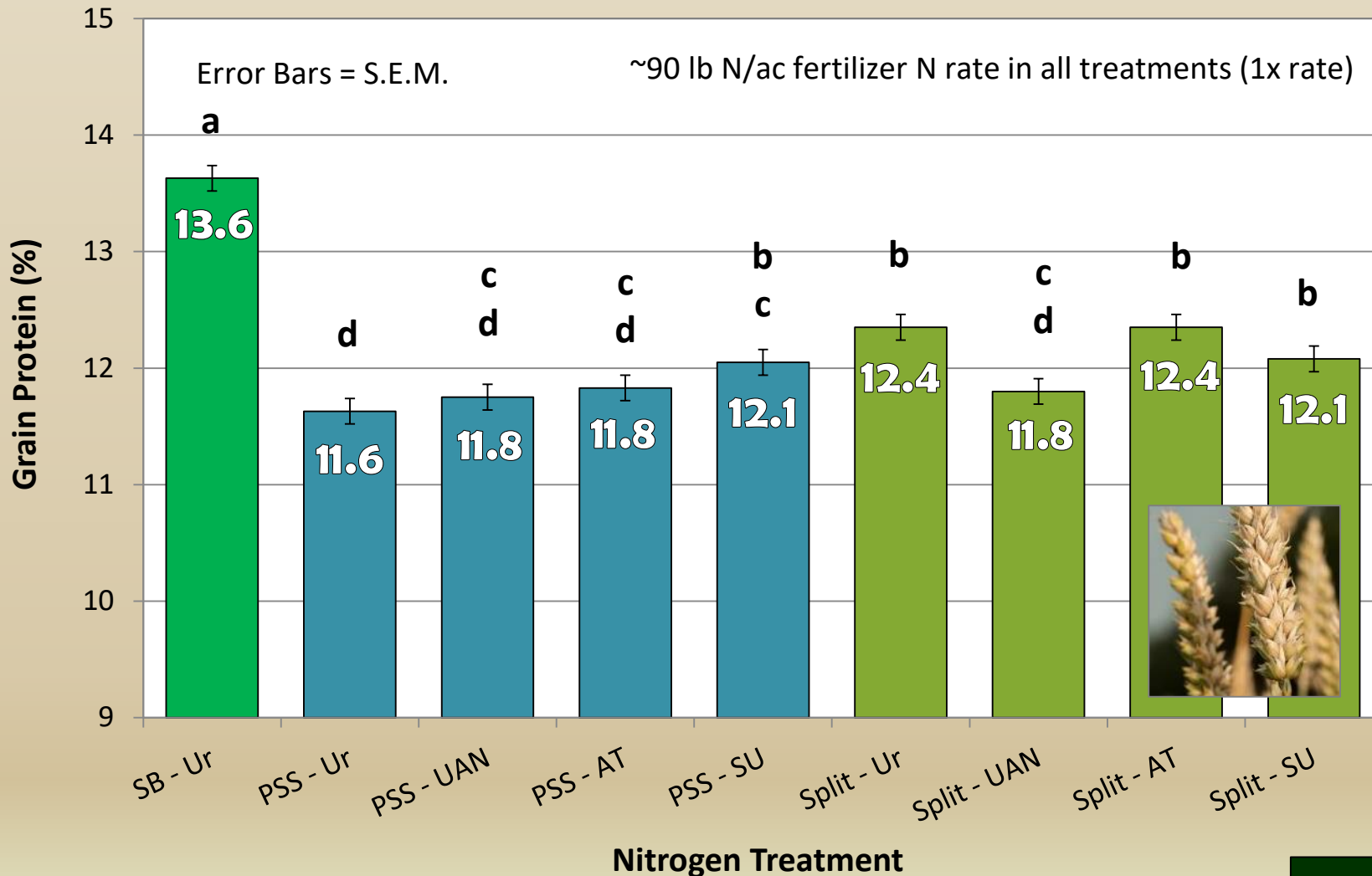
N Management Effects on Wheat Grain Yield Indian Head 2017



N Rate Effects on Wheat Grain Protein Indian Head 2017



N Management Effects on Wheat Grain Protein Indian Head 2017



Effect of In-Crop N Rate & Timing on Durum Indian Head & Swift Current 2001-03 (B. May – AAFC)

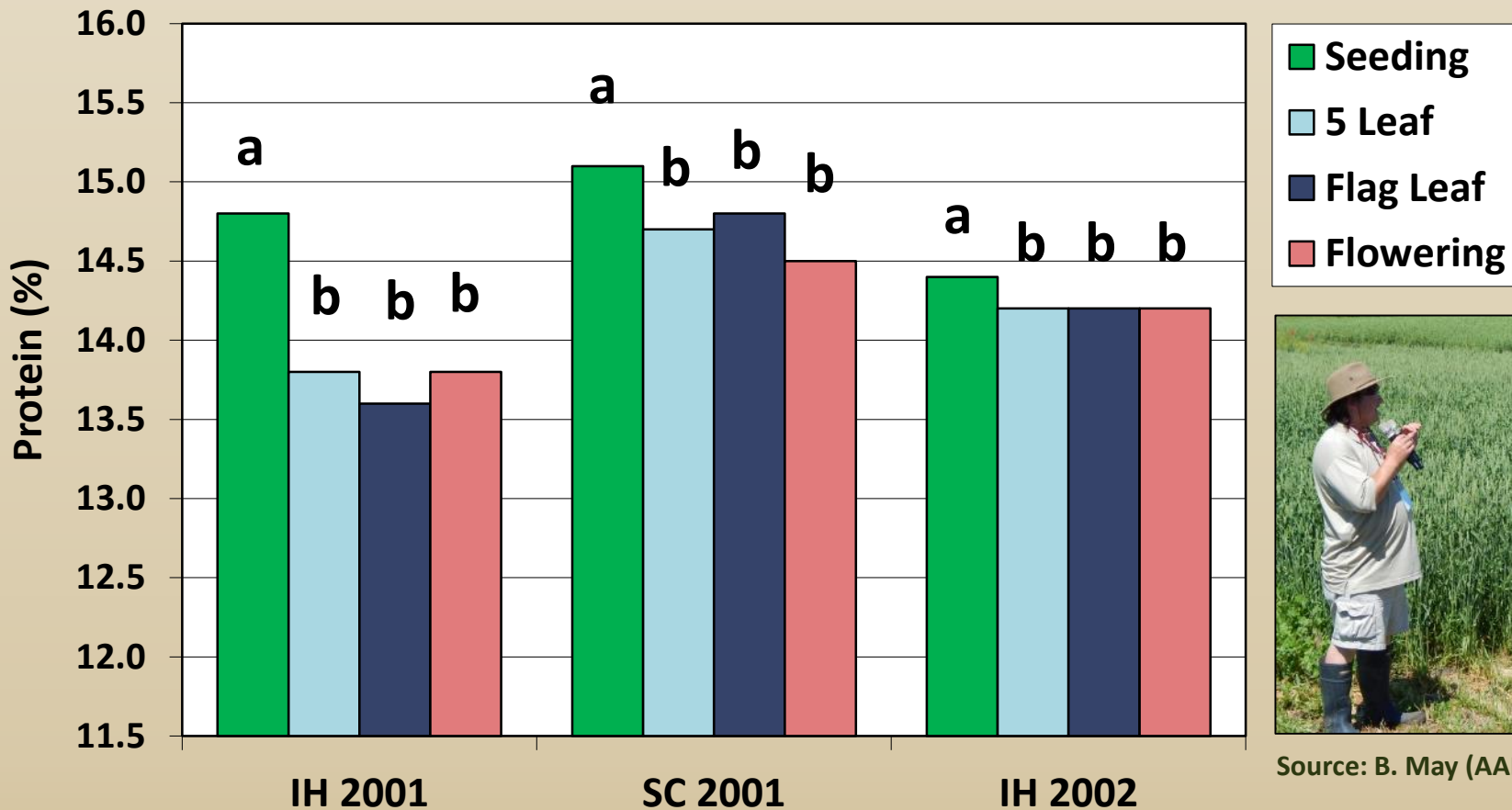
Objectives: To help farmers improve the protein level and quality of durum

#	N at Seeding	Extra N Rate	Extra N Timing
1	nil	Nil	N/A
2	75%	Nil	N/A
3	75%	18 lb N/ac	Seeding (banded urea)
4	75%	36 lb N/ac	Seeding (banded urea)
5	75%	53 lb N/ac	Seeding (banded urea)
6	75%	18 lb N/ac	5 leaf (surface UAN)
7	75%	36 lb N/ac	5 leaf (surface UAN)
8	75%	53 lb N/ac	5 leaf (surface UAN)
9	75%	18 lb N/ac	Flag leaf (surface UAN)
10	75%	36 lb N/ac	Flag leaf (surface UAN)
11	75%	53 lb N/ac	Flag leaf (surface UAN)
12	75%	18 lb N/ac	Anthesis (surface UAN)
13	75%	36 lb N/ac	Anthesis (surface UAN)
14	75%	53 lb N/ac	Anthesis (surface UAN)



- Each N treatment tested on 1 of 4 varieties (AC Avonlea, AC Morse, AC Navigator or Kyle)

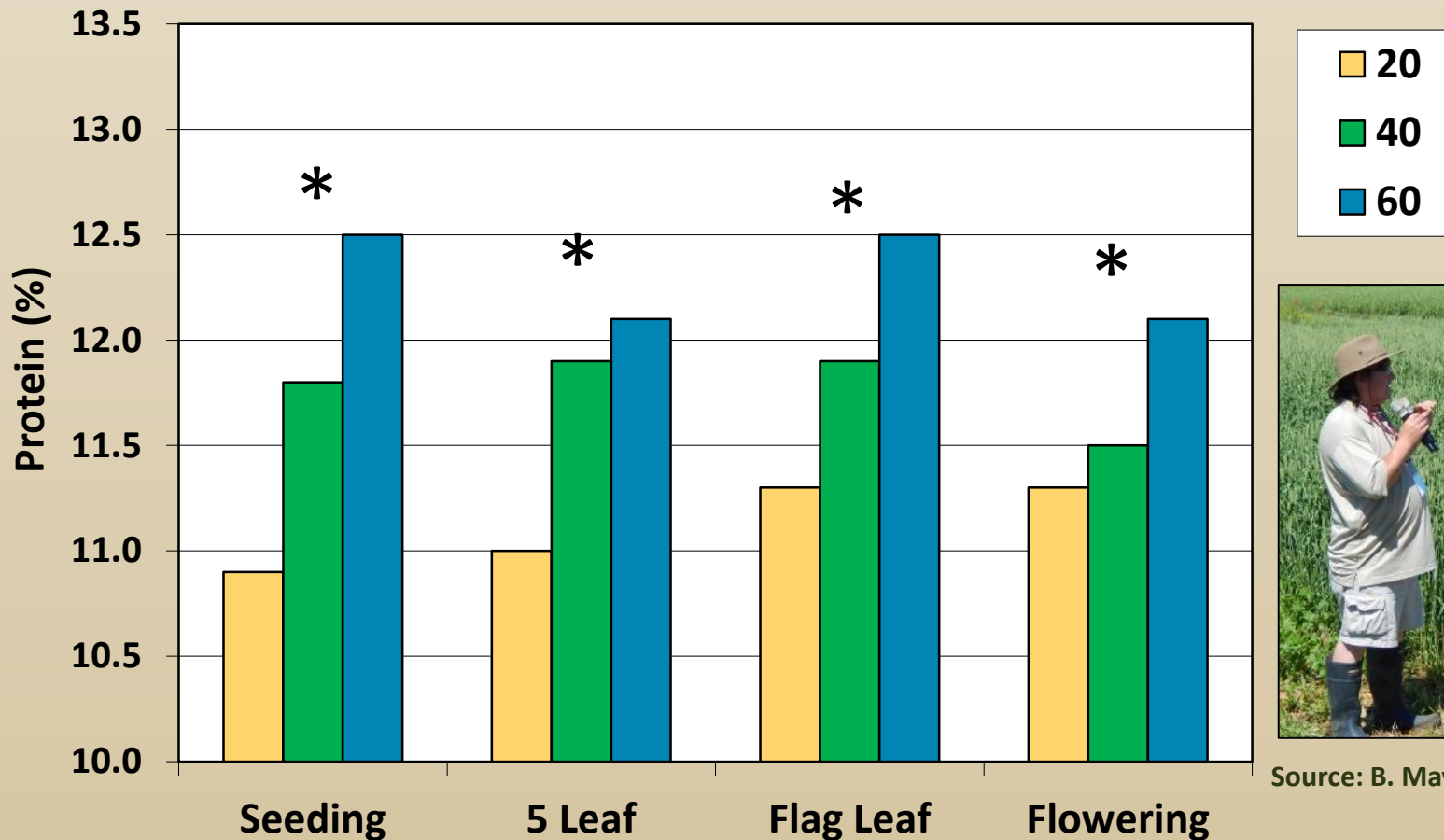
N Timing Effects on Durum Protein



Source: B. May (AAFC)

The effect on N timing on protein in 2001(both sites) & at Indian Head in 2002

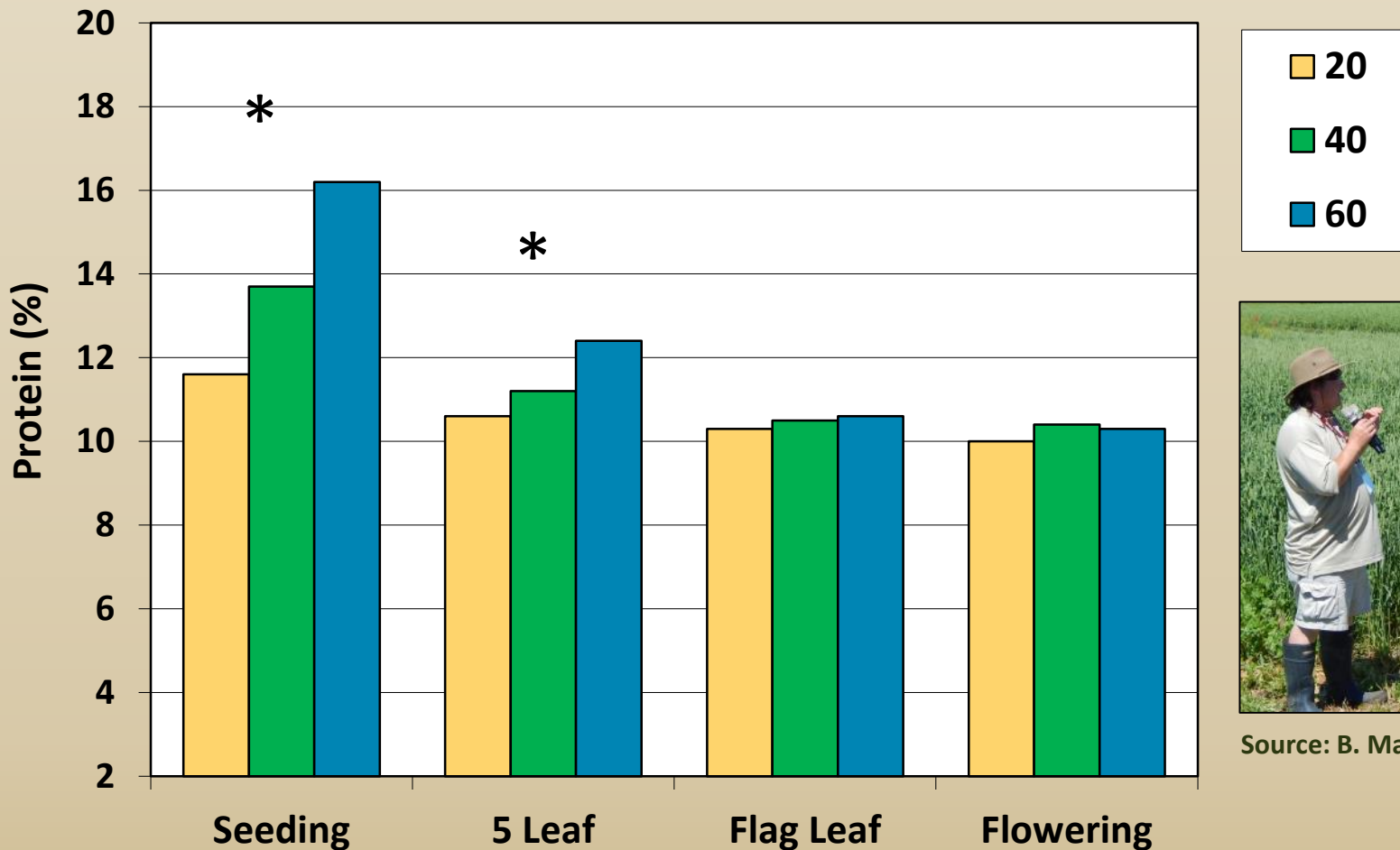
N Rate & Timing Effects on Durum Protein



Source: B. May (AAFC)

The effect of N timing & rate on protein at Swift Current in 2002

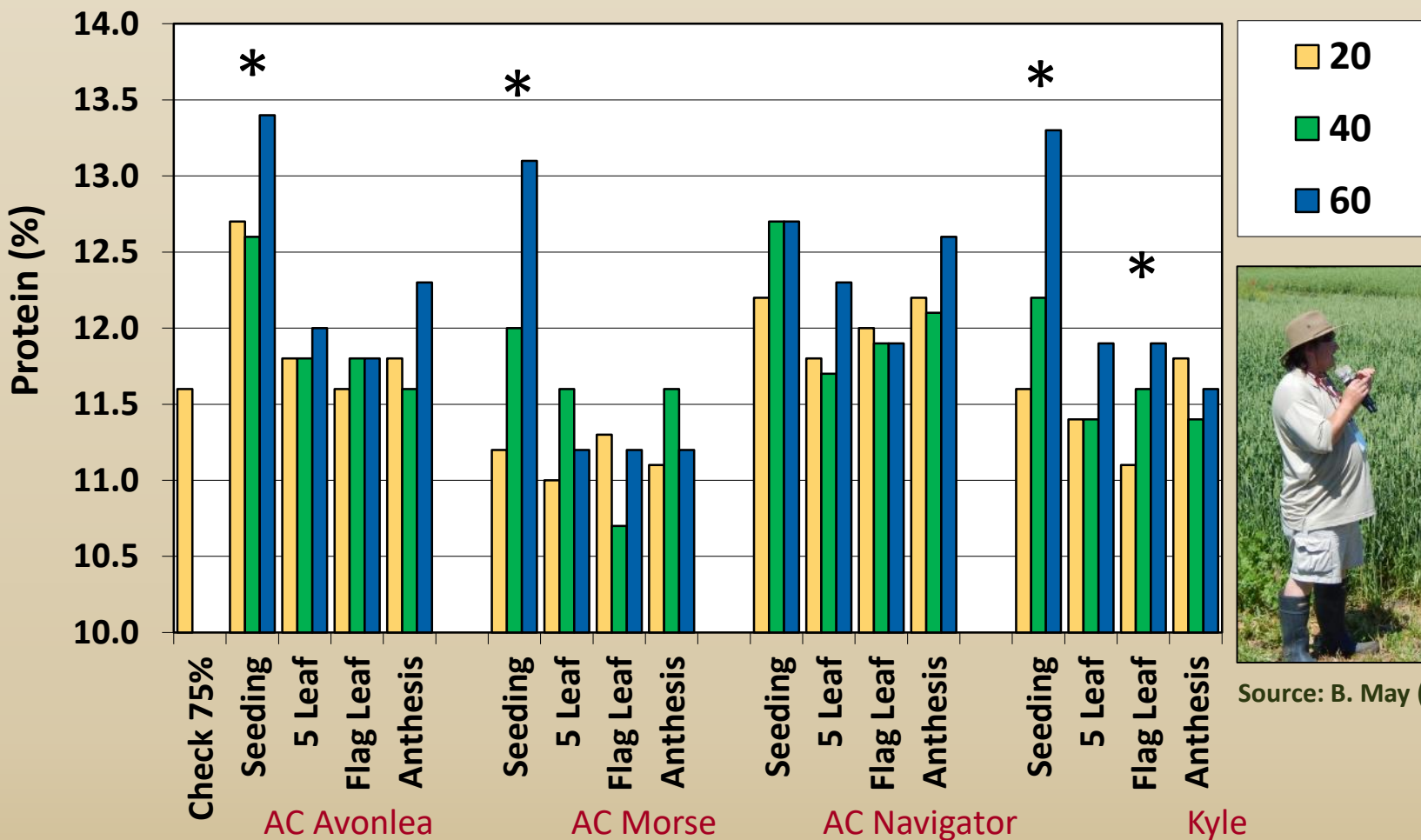
N Rate & Timing Effects on Durum Protein



Source: B. May (AAFC)

The effect of N timing & rate on protein at Swift Current in 2003

Variety, N Rate & Timing Effects on Durum Protein



Source: B. May (AAFC)

The effect of variety, N timing & rate on protein at Indian Head in 2003

Production Challenge #3: Disease



Variety & Fungicides to Manage Leaf & Head Disease

Indian Head 2013-14

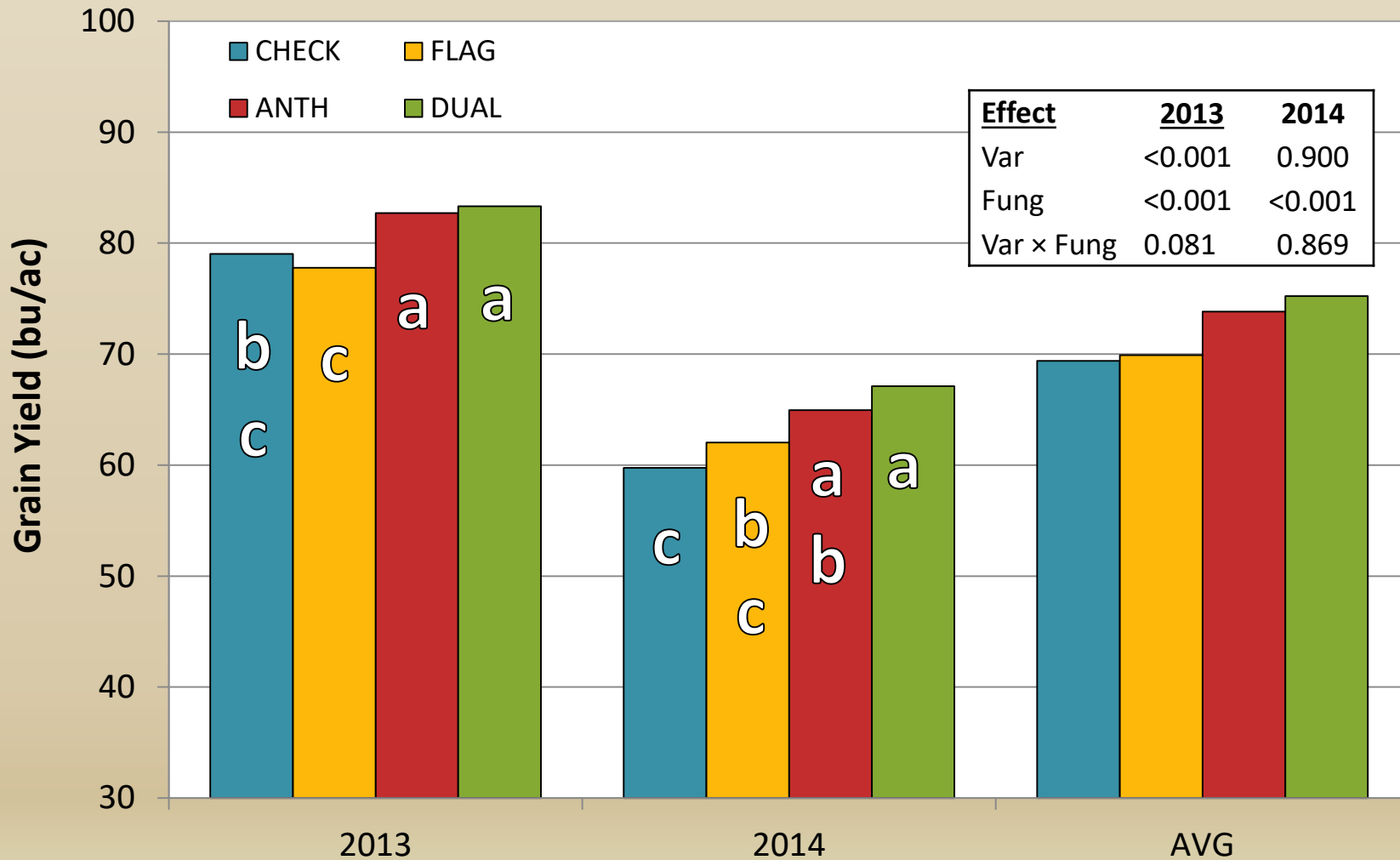
Objectives: To demonstrate the effects varietal selection & fungicide timing on leaf spot diseases and fusarium head blight on spring wheat.

#	Variety ^z	Foliar Fungicide Treatment
1	Unity VB	None applied
2	Unity VB	GS39-41 (Twinline)
3	Unity VB	GS60-65 (Prosaro)
4	Unity VB	Dual (fungicide applied at both stages)
5	Shaw/Goodeve VB	None applied
6	Shaw/Goodeve VB	GS39-41 (Twinline)
7	Shaw/Goodeve VB	GS60-65 (Prosaro)
8	Shaw/Goodeve VB	Dual (fungicide applied at both stages)



- Unity VB (now CNHR) grown both years – Rated **I** for both leaf spot disease and FHB
- Shaw (2013) & Goodeve (2014) – Rated **MS** for leaf spot disease & **S** for FHB

Fungicide Product & Timing Effects on Yield Indian Head 2013-14



Seed Rates & Fungicides to Manage FHB

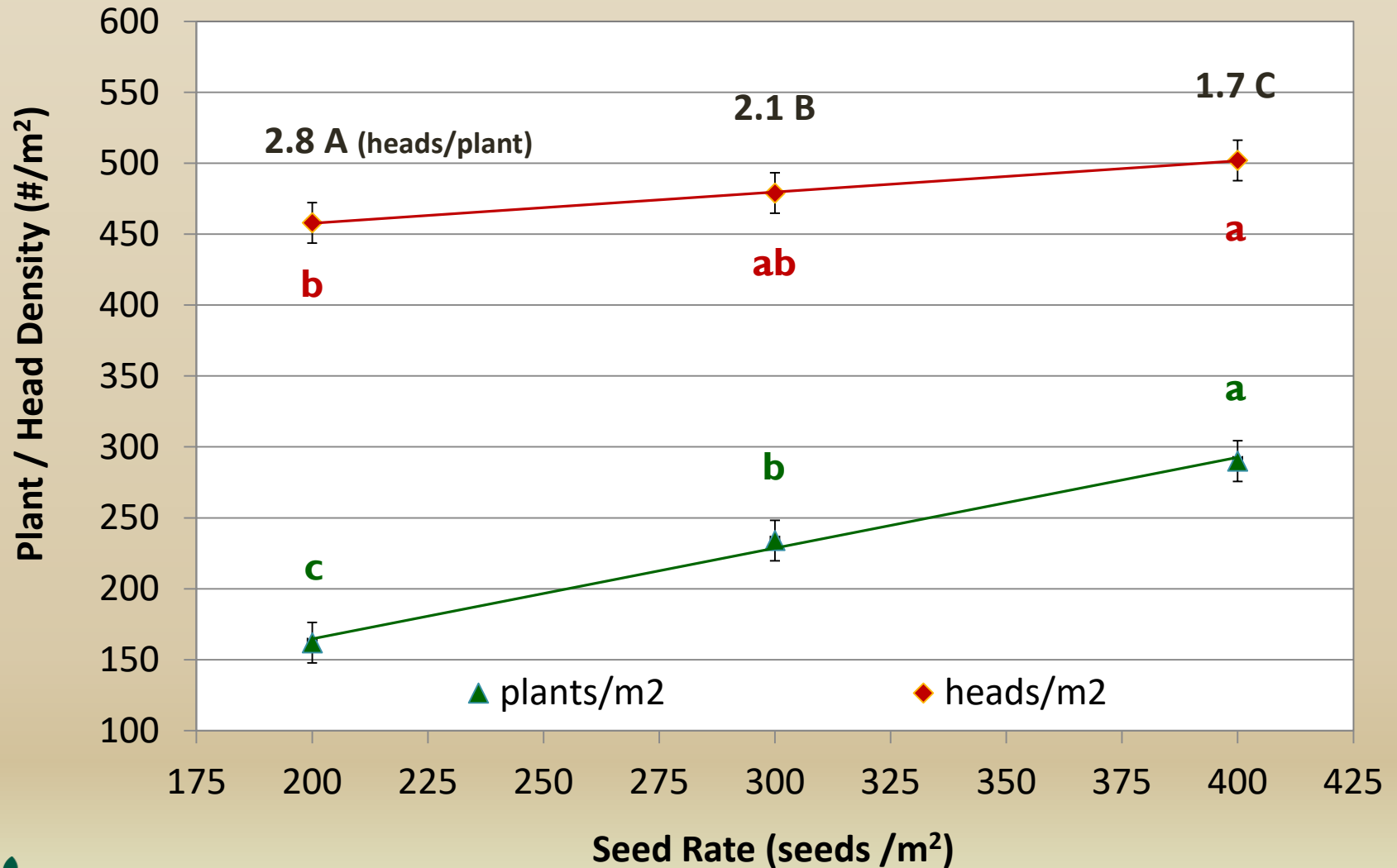
Indian Head 2015

Objectives: To demonstrate the effects of seeding rates and foliar fungicide applications to reduce the impacts of FHB on durum yield & quality

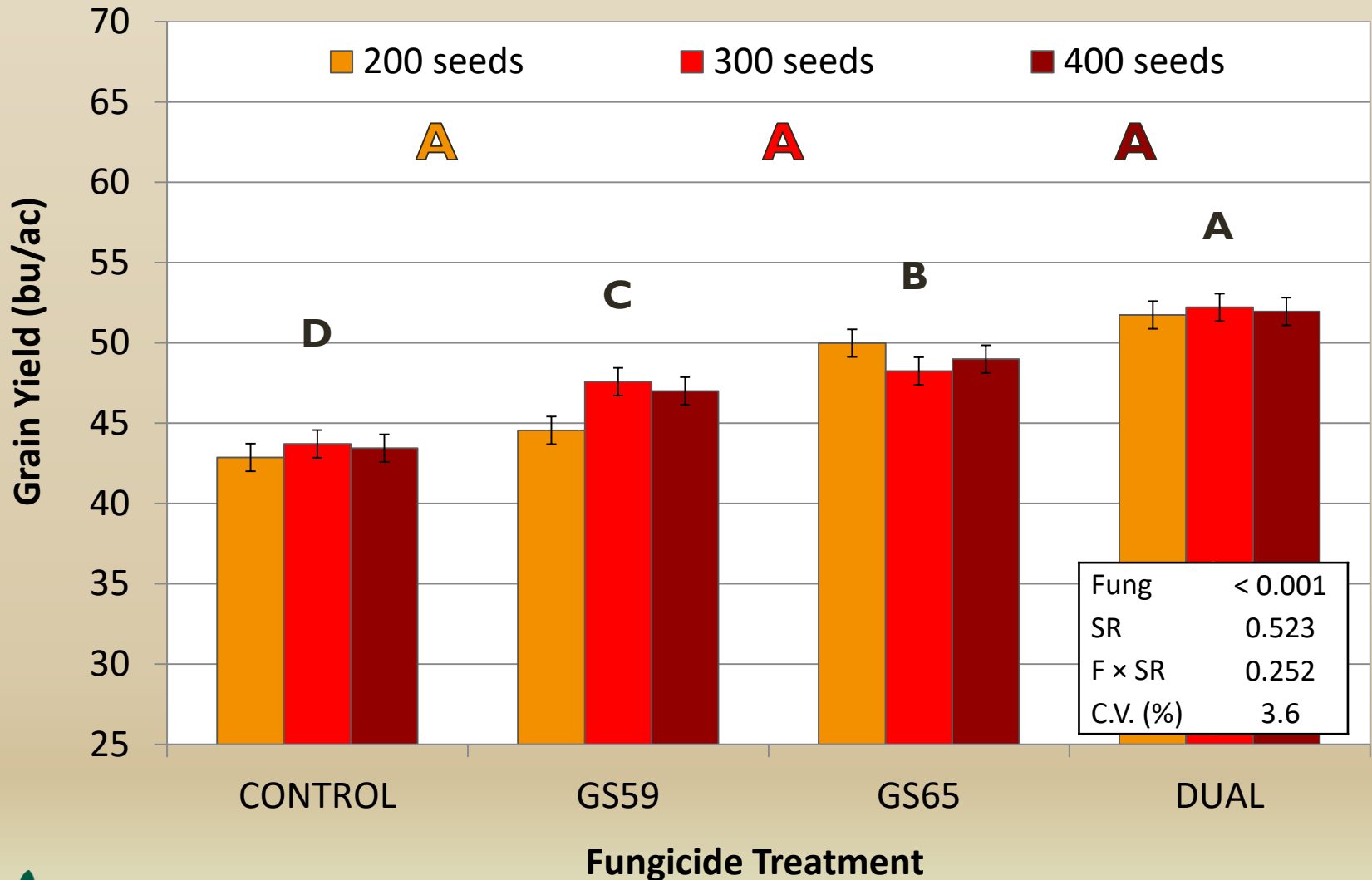
#	Seeding Rate	Foliar Fungicide
1	200 seeds/m ²	None applied
2	200 seeds/m ²	Prosaro at GS59 (early heading)
3	200 seeds/m ²	Prosaro at GS65 (anthesis)
4	200 seeds/m ²	Dual (fungicide applied at both stages)
5	300 seeds/m ²	None applied
6	300 seeds/m ²	Prosaro at GS59 (early heading)
7	300 seeds/m ²	Prosaro at GS65 (anthesis)
8	300 seeds/m ²	Dual (fungicide applied at both stages)
9	400 seeds/m ²	None applied
10	400 seeds/m ²	Prosaro at GS59 (early heading)
11	400 seeds/m ²	Prosaro at GS65 (anthesis)
12	400 seeds/m ²	Dual (fungicide applied at both stages)

* No flag-leaf fungicide applied in any treatments

Seed Rate Effects on Emergence & Tillering Indian Head 2015



Seed Rate & Fungicide Effects on Grain Yield Indian Head 2015



Fungicide Effects on Leaf Disease in Durum (Aug 10, 2015)



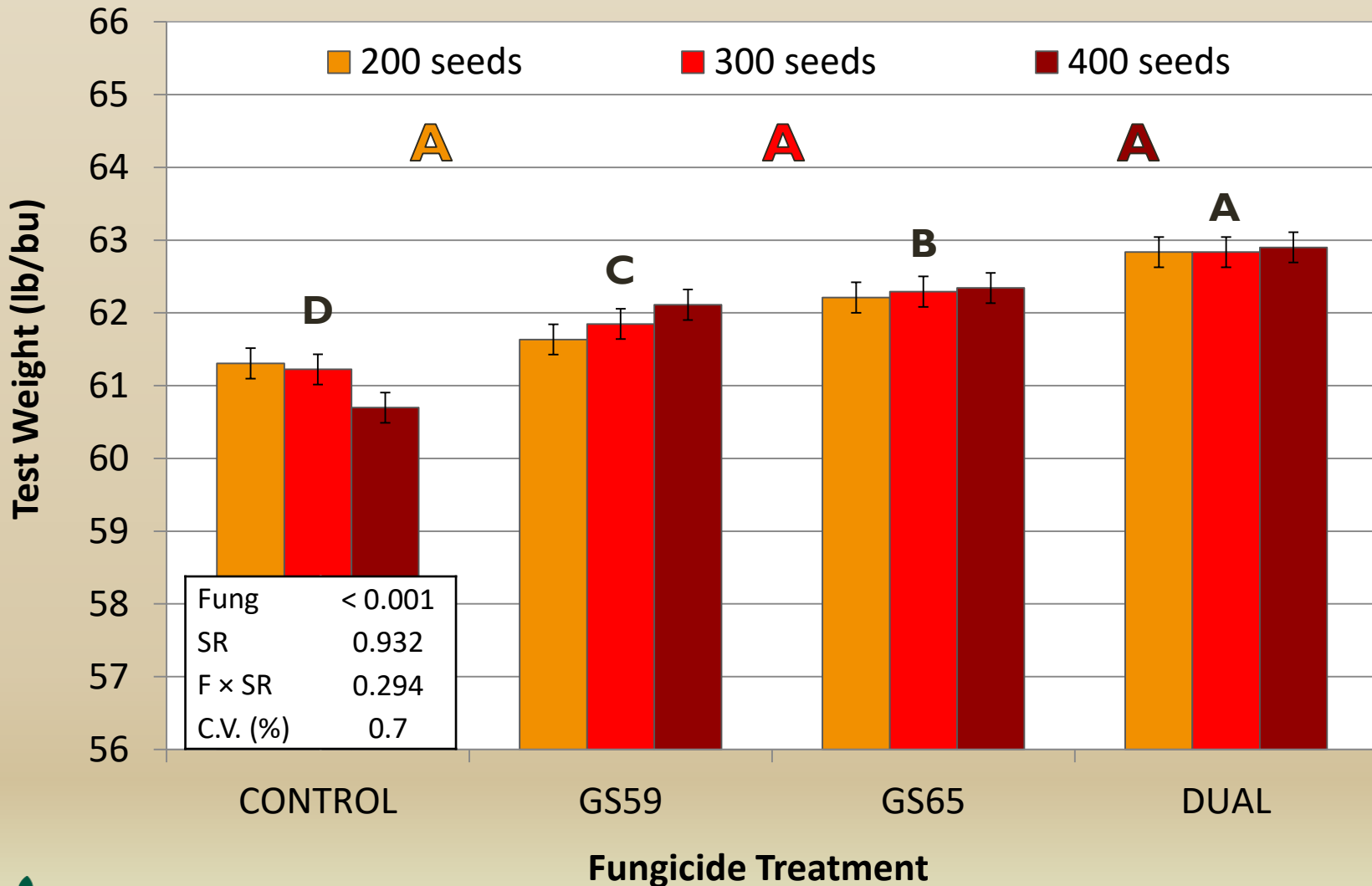
Unsprayed



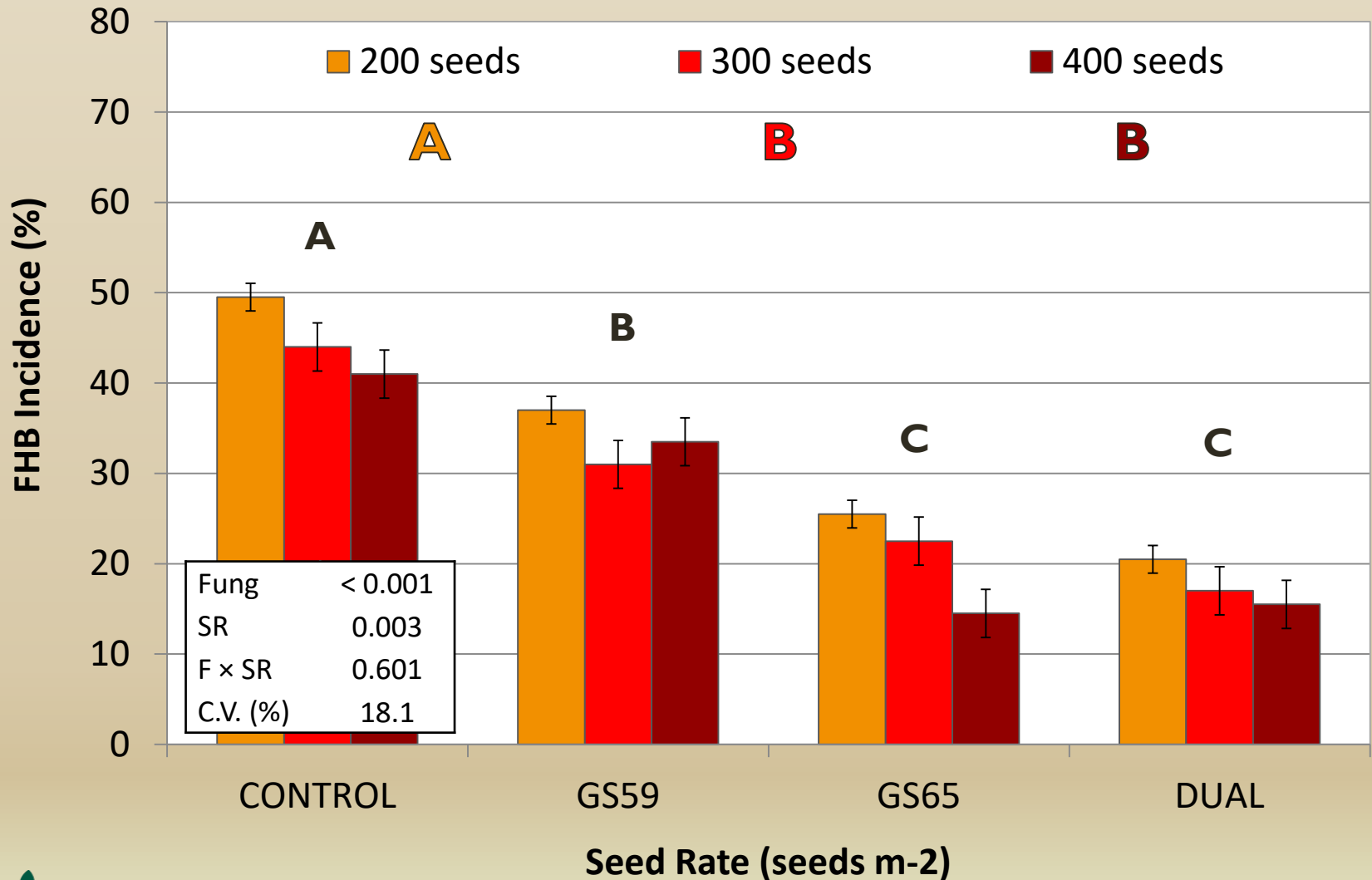
Prosaro

- FHB applications often provide good protection against leaf spot diseases but optimal timing for the two can differ (often get better FHB protection at later stages of fungicide application window)

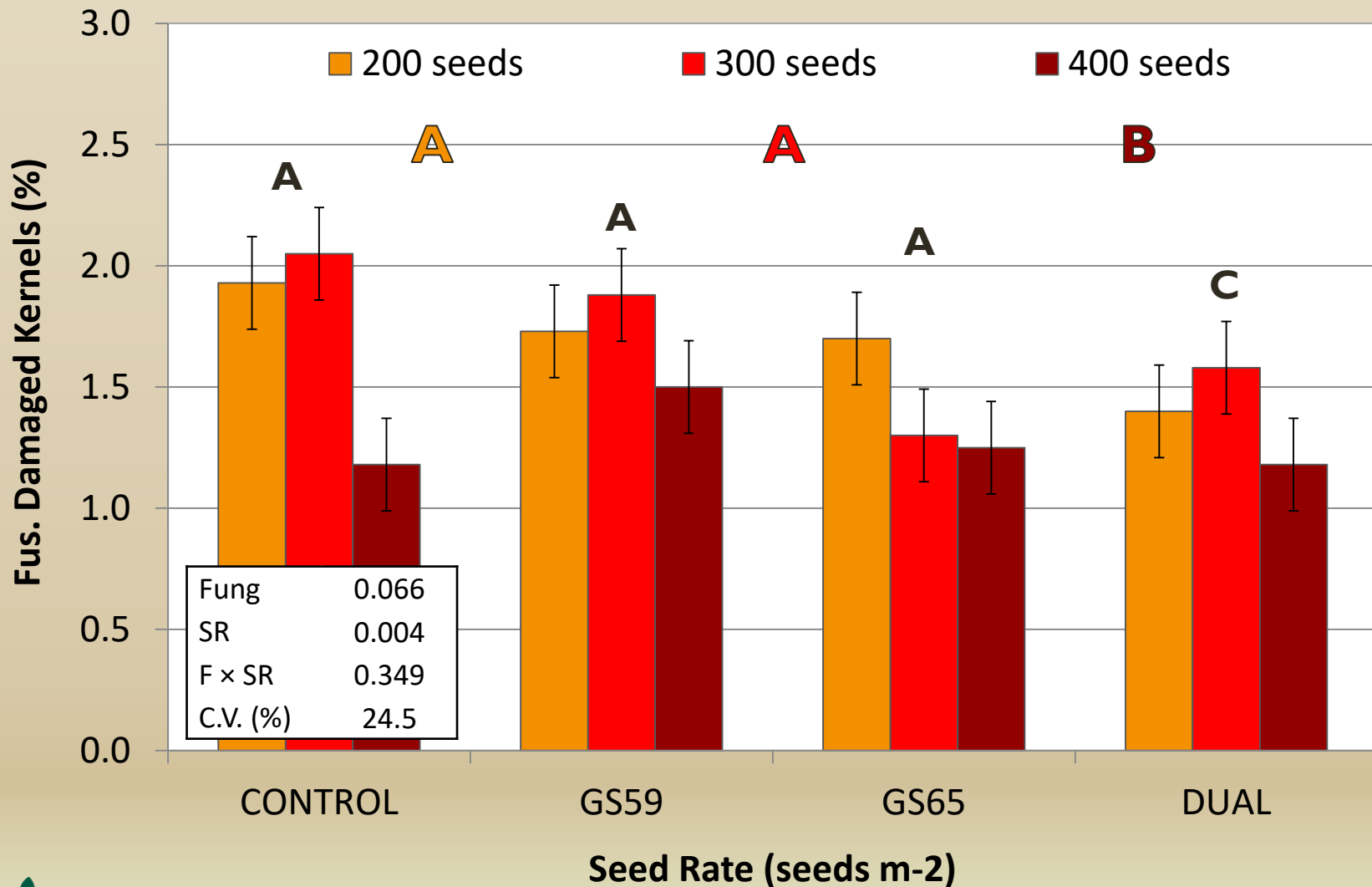
Seed Rate & Fungicide Effects on Test Weight Indian Head 2015



Seed Rate & Fungicide Effects on FHB Incidence Indian Head 2015



Seed Rate & Fungicide Effects on FDK Indian Head 2015



Recap: Take-home Messages

- More than 11 million ac of wheat in SK in 2017, nearly 1/3 of all cropped land (including hay)

Lodging

- Bigger issue in wet years/regions - can reduce both yield & harvest efficiency
- Primarily managed through variety selection but influences other decisions (i.e. N or seed rates)
- PGR a useful tool that has shown consistent benefits – Manipulator to be permitted in 2018
- Have seen yield increases in absence of lodging but greatest benefits expected under wetter conditions, with varieties prone to lodging & higher inputs

Protein

- Aside from genetics & environment, primarily affected by N management
- Optimum N rate for protein generally higher than that required to maximize yield
- No ‘magic bullet’, have not seen consistent benefits to enhanced efficiency N products & often get the highest protein banding all N at seeding versus split-applications, especially when dry
- Greater potential for advantages to slow release N or split-applications in very wet years, but split apps may also have merit for reducing financial risk under severe drought

Disease

- Except under heavy early season pressure (scout often!), spraying for FHB often provides adequate leaf disease protection but fungicides alone are often insufficient to protect grade
- Higher seeding rates can also contribute to reducing quality loss by narrowing infection window & increasing field uniformity (easier to time spraying)
- Integrated approach required: Start with the best genetic resistance & sound overall agronomy – foliar fungicides effective but are the last line of defense

THANK YOU

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