Soybeans: Expectations vs Results

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www.ecrf.ca

Cultivate (blacken) the soil to warm it up.

- We wanted to demonstrate the importance of seeding soybeans into warm soil to avoid “cold shock” and improve plant vigor and yield.

Planted into 21°C soil and kept at that temperature for 17 days

Planted into 7°C soil for 20 hours
Then 21°C for remaining 17 days
COLD SHOCK!!

Planted into 21°C soil for 8 hours
Then 7°C for 4 days
Then 21°C for remaining 13 days

Courtesy of Northstar

Cultivate (blacken) the soil to warm it up for better production of soybean.

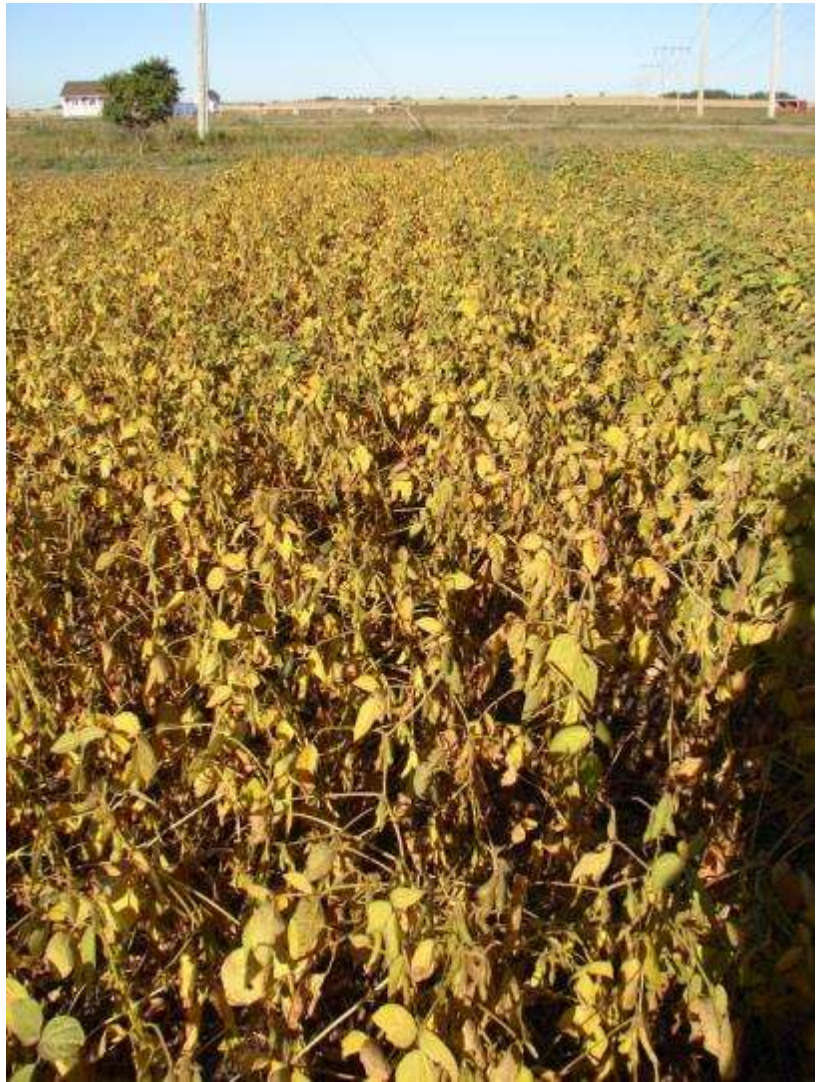
- First attempt to demonstrate
  - Rotovated May 19, 2013
  - Seeded multiple varieties May 24, 2013 into rotovated and undisturbed soil.
  - Expectation: Soybeans seeded into warmer rotovated soil expected to mature faster, be taller with a longer first internode and higher yielding.
  - Result: Soybeans seeded into rotovated soil did mature faster but were shorter with a shorter first internode and yielded worse.

Maturity: rotovated versus directed seeded Vito

Vito rotovated

Sept 12, 2013

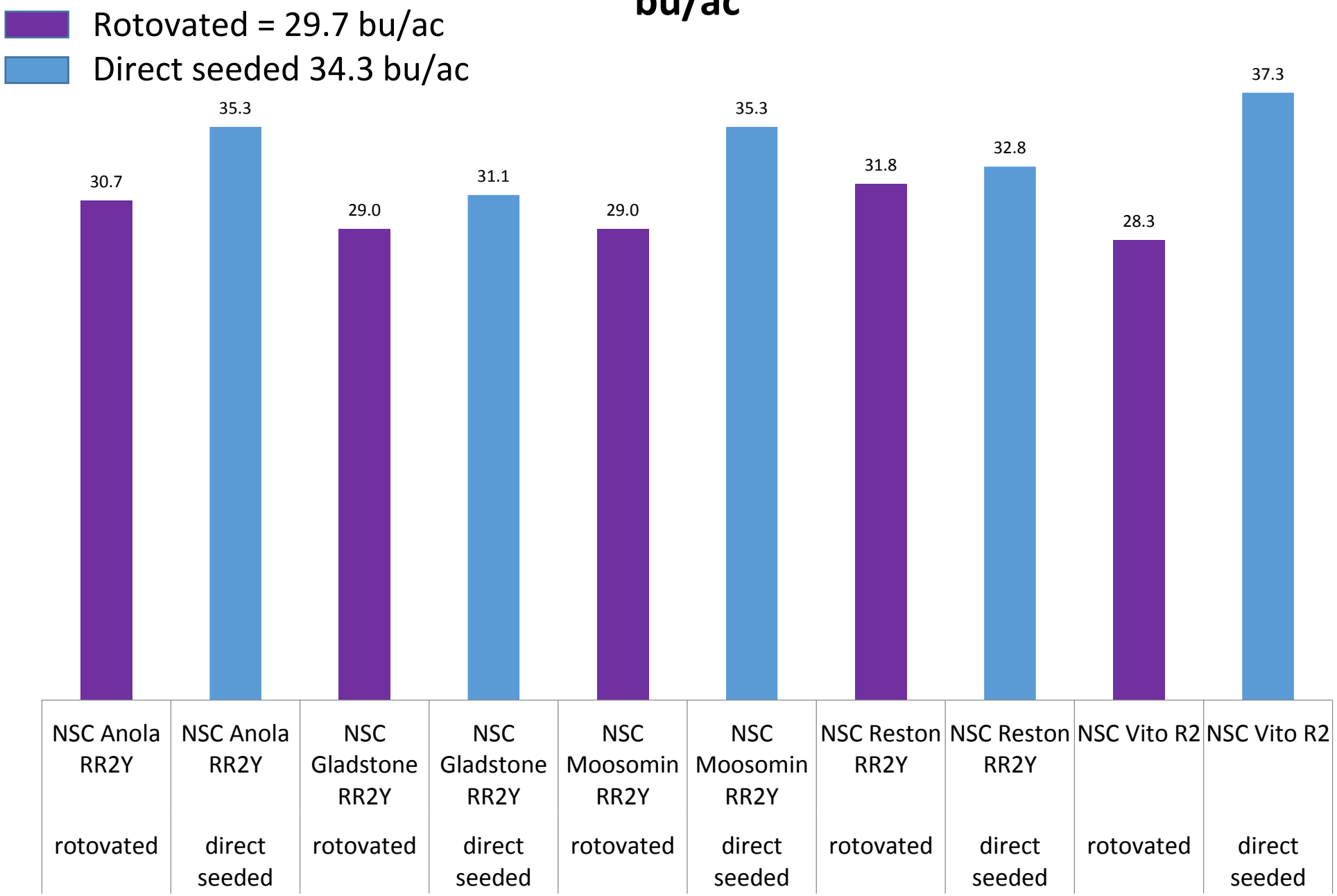
Vito direct seeded into stubble



Average Height of Rotovated Varieties: =22.7 inches (internode 2.3 inches)

Average Height of Direct Seeded Varieties: =27.5 inches (Internode 2.5 inches)

Direct seeded and rotovated Soybean yields by variety bu/ac



Why did rotovated plots perform worse?

Did rotovation

- Result in deeper seeding?
  - Possibly, but it didn’t affect emergence or early stand establishment
- Did it dry out the soil and/or reduce nitrogen fixation
  - Best explanation. Reduced nitrogen fixation and less soil moisture would result in earlier maturity and lower yield.

The Influence of Fall Cultivation and Seeding Date on Soybean Production (2016)

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EAST CENTRAL RESEARCH FOUNDATION
ECRF

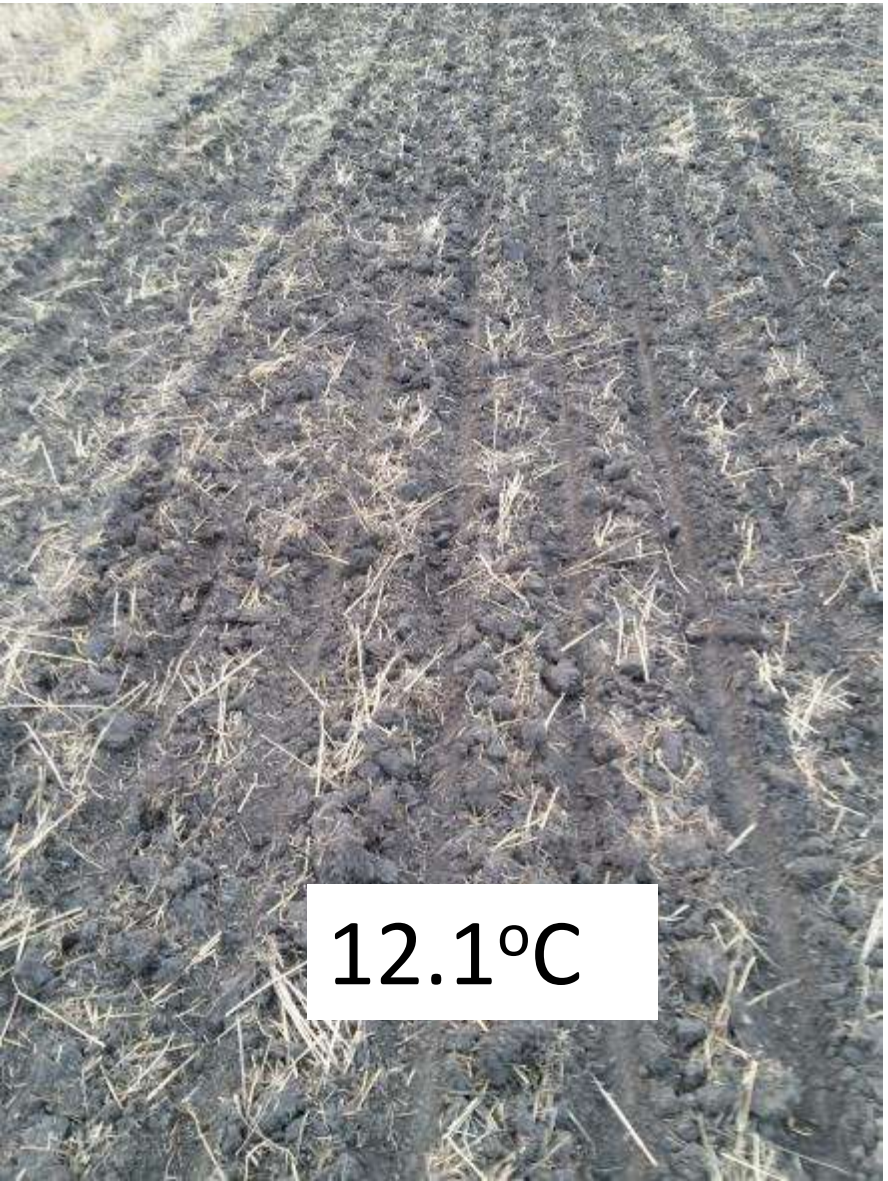
Treatment list

1. Cultivated in fall; Soybean seeded May 5th.
2. Cultivated in fall; Soybean seeded May 16th.
3. Cultivated in fall; Soybean seeded May 24th.
4. Standing stubble; Soybean seeded May 5th.
5. Standing stubble; Soybean seeded May 16th.
6. Standing stubble; Soybean seeded May 24th.


Sept 24, 2015

Seeded May 5th

Seeded into cultivated



Seeded into stubble

Seeded May 5
into cultivated soil

Photos taken June 27

Seeded May 5
into standing stubble

Table 5. Main Effects of Fall Cultivation and Seeding Date on Emergence, Maturity a Yield of Soybean[1].			
Main effects	Emergence (plants/ft^2)	Maturity[2]	Yield (bu/ac)
Stubble Management in Fall (F)			
Cultivated	4.8 a	55.0 a	42.4 a
Standing stubble (No cultivation)	4.8 a	52.5 a	40.1 a
Seeding Date (S)			
May 5	4.9 a	78.1 a	42.8 a
May 16	5.3 a	53.1 b	40.0 a
May 24	4.2 a	30.0 c	40.9 a
Significance of Interactions between main effects[3]			
(F) X (S)	NS	NS	NS

Effect of Stubble Management and Seeding Date on Yield of Soybean (Bu/ac)

Stubble Management	May 5	May 16	May 24
Fall Cultivated	45 a	41.1 a	41.1 a
Standing Stubble	40.7 a	39 a	40.9 a

Cultivate (blacken) the soil to warm it up for better production of soybean.

Conclusion:

- There was some evidence to support cultivation could benefit soybean production when soybeans were seeded early.
- The benefit may have been even higher if the trash were heavier or there had been a frost.
- However, these benefits need to be weighed against soil conservation concerns.
- Also consider that soybeans shouldn’t be seeded until Mid to late May and in our experiment cultivated soil didn’t provide much of a benefit at those seeding dates.

Seed mid to late May is optimum

- Seeding too early runs the risk of “Cold Shock” and damage from late spring frosts.
- Seeding too late reduces yield and increases chance of fall frost damage and green seed.

Table 5. Main Effects of Fall Cultivation and Seeding Date on Emergence, Maturity and Yield of Soybean[1].			
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Significance of Interactions between main effects[3]			
(F) X (S)	NS	NS	NS

[1]Means within a main effect followed by the same letter are not significantly different p=0.05

[2]Percent pod color change by Sept 19

[3]NS, not significant at p=0.05; S, significant at p=0.05

Photos taken September 19

Seeded May 5 into cultivated soil

Seeded May 16 into cultivated soil

Seeded May 24 into cultivated soil

Soybeans-Importance of Dual Inoculation and Seeding into Warm Soil 2017

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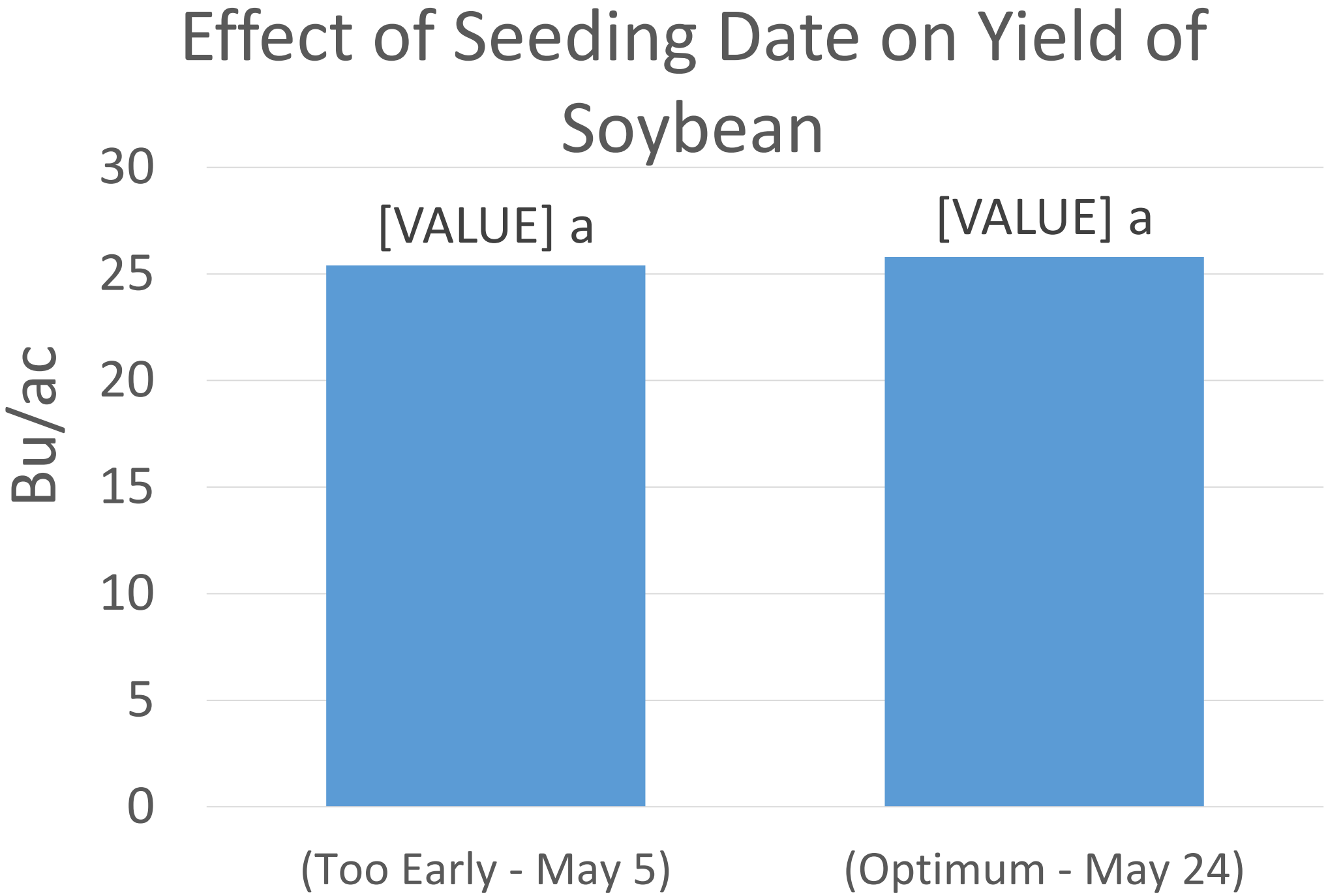

Effect of Seeding Date on Yield of Soybean
Bu/ac
30
25
20
15
10
5
0
[VALUE] a
[VALUE] a
(Too Early - May 5)
(Optimum - May 24)

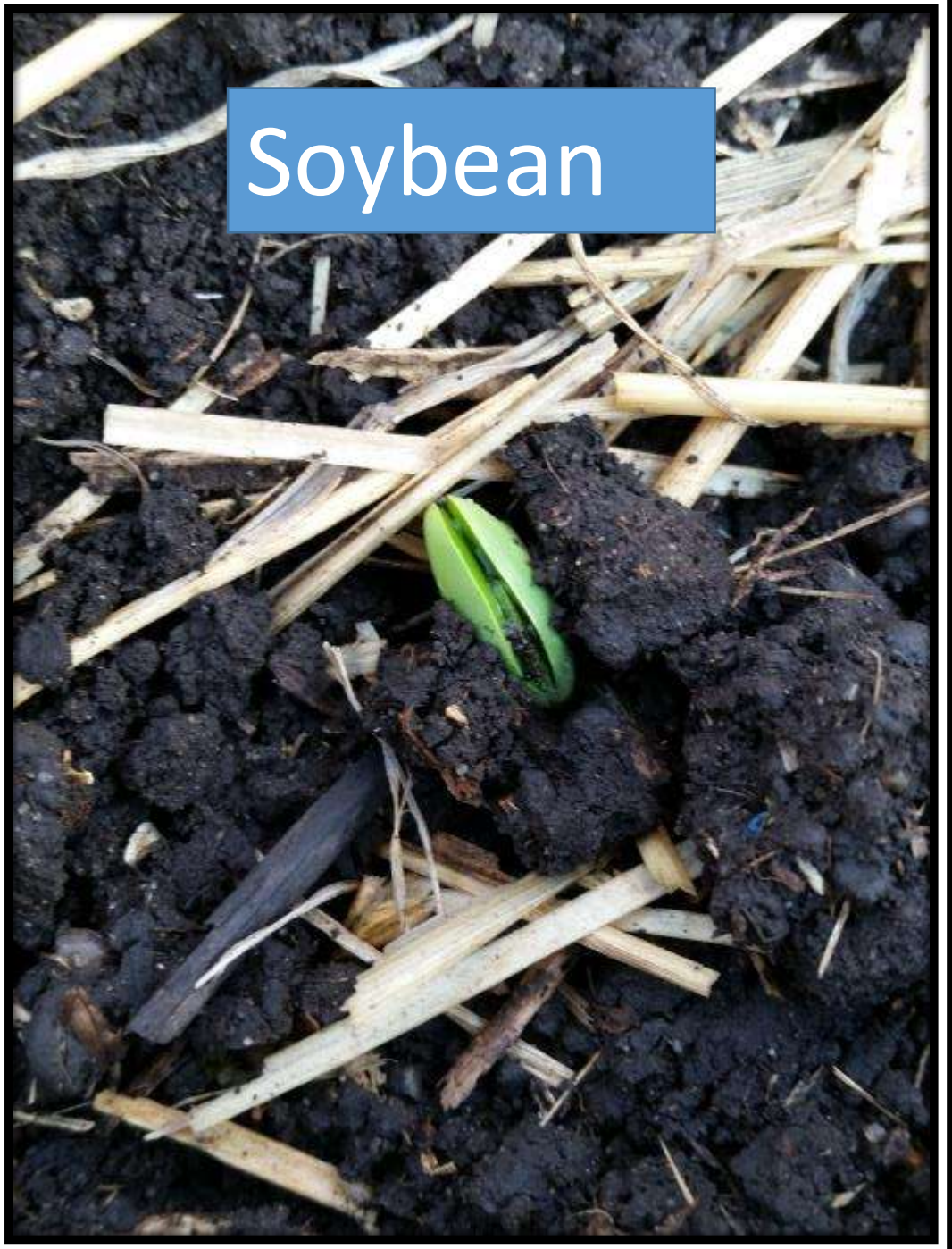
Results would have been different if this trial was seeded in 2015

- Killing frost of minus 2 to 4 degrees on May 30.
- The soybeans seeded on May 5 would have died.

I dodged a bullet!

Canola

Soybean




Faba bean


Peas


Wheat

Soybean Variety trials 2014

Two Seeding dates

- May 22, 2014 (9°C)
- June 3, 2014 (15°C)

By
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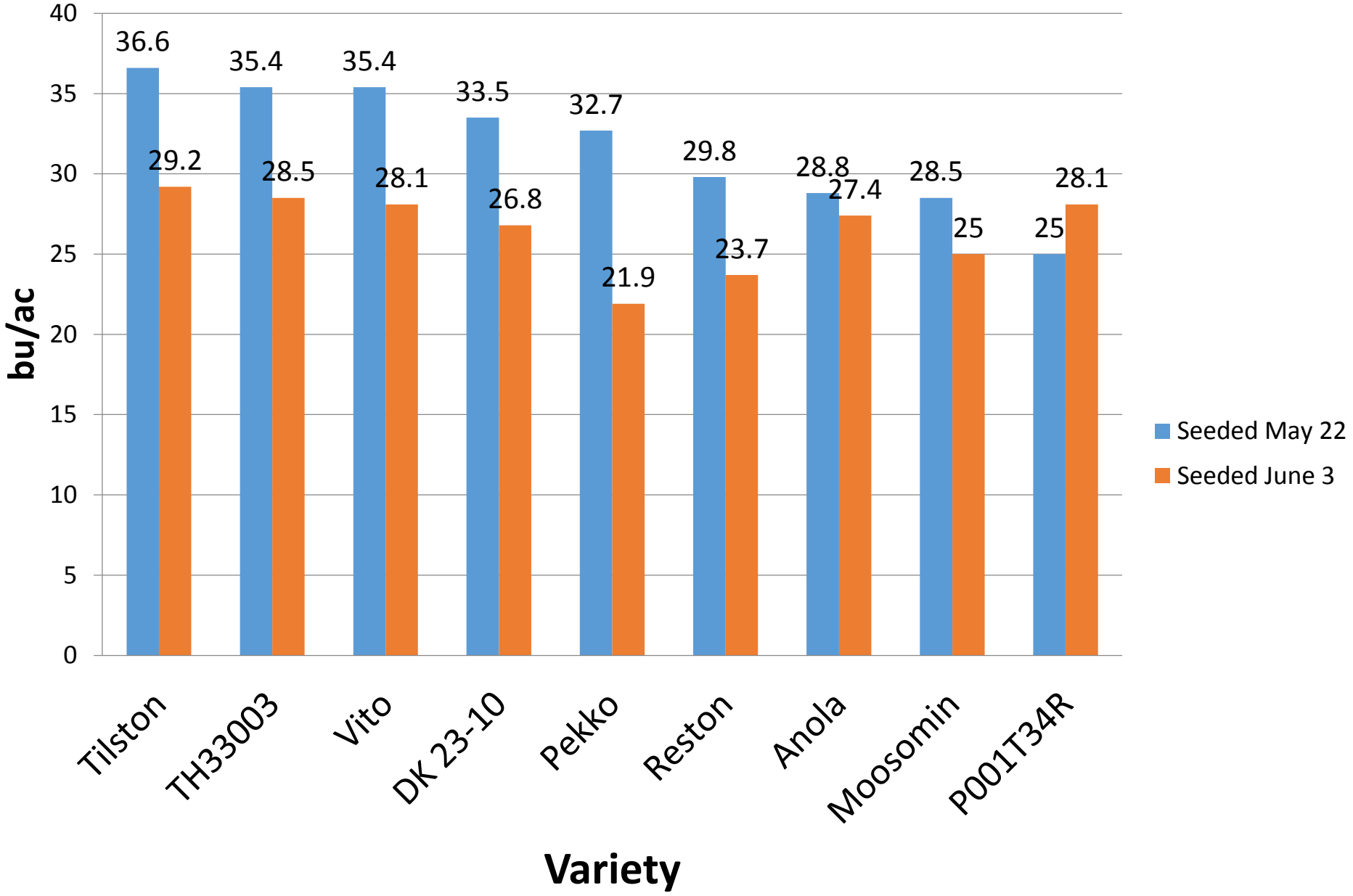
Research Manager

Figure 2. Influence of seeding date on soybean yield. Lsd=4.16 (within a seeding date) Lsd= 4.77 between seeding dates)



Sept 30, 2014

Seeded
May 22

P001t34r

Moosomin

Tilston

Anola

Seeded
June 3

October 6, 2014


P001t34r


Moosomin

Seeded
May 22


Tilston


Anola

Seeded
June 3

Figure 1. Seed samples from early (P001T34R), mid (NSC Tilston) and late (NSC Anola) season varieties seeded early (May 22) and late (June 3)

Moosomin

Seeded: May 24, 2013
Picture: September 23, 2013

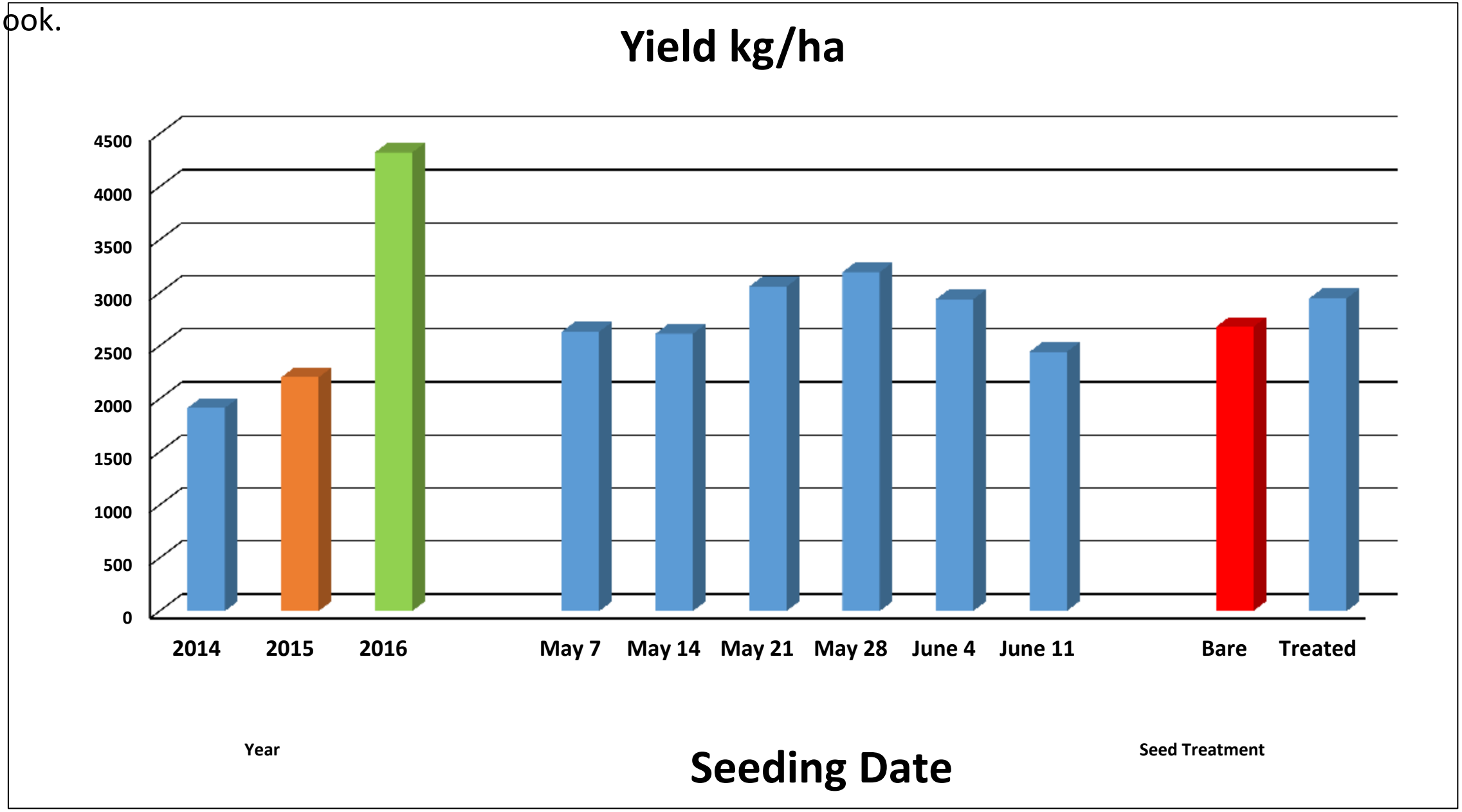
Seeded: May 22, 2014
Picture: September 22, 2014

Seeding mid to late May is optimum

Conclusions:

- We were unable to cold shock soybeans by seeding early or reduce yield.
- However, still risky to seed in Early May. Yield was not reduced by waiting until Mid/late May to seed.
- Early June was too late to seed soybeans.
- Seeding Mid/late May is optimum and the window is small.

Figure 8. Impact of Trial Year, Seeding Date and Chemical Seed Treatment on Soybean Yield, 2014-16 ICDC Outlook.



Dual Inoculate soybeans

- General recommendation in Manitoba is to Dual Inoculate soybeans if land doesn’t have a recent history of two well nodulated soybean crops.
- Dual inoculation means inoculant on seed and granular banded to the side.

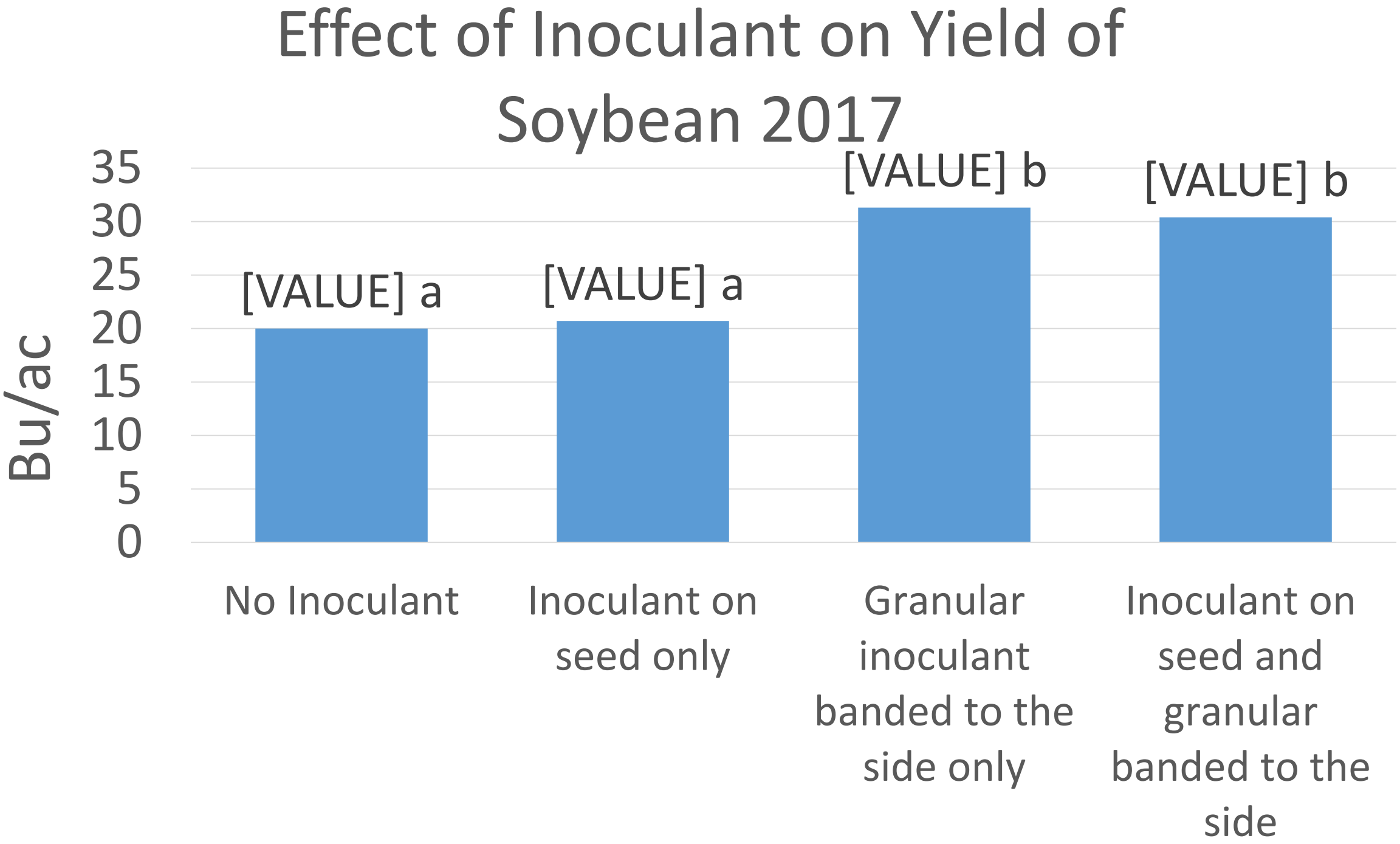

Effect of Inoculant on Yield of Soybean 2017
Bu/ac
35
30
25
20
15
10
5
0
[VALUE] a
[VALUE] a
[VALUE] b
[VALUE] b
No Inoculant
Inoculant on seed only
Granular inoculant banded to the side only
Inoculant on seed and granular banded to the side

Figure 1.
Effect of Inoculant on Root Nodules of Soybean

No Inoculant

Inoculant on Seed Only

Side-banded Granular Inoculant

Inoculant on Seed and Side-banded Granular

Figure 2.
Effect of Inoculant on of Soybean

No Inoculant

Inoculant on Seed Only

Side-banded Granular Inoculant

Inoculant on Seed and Side-banded Granular

Dual Inoculate soybeans

Conclusions:

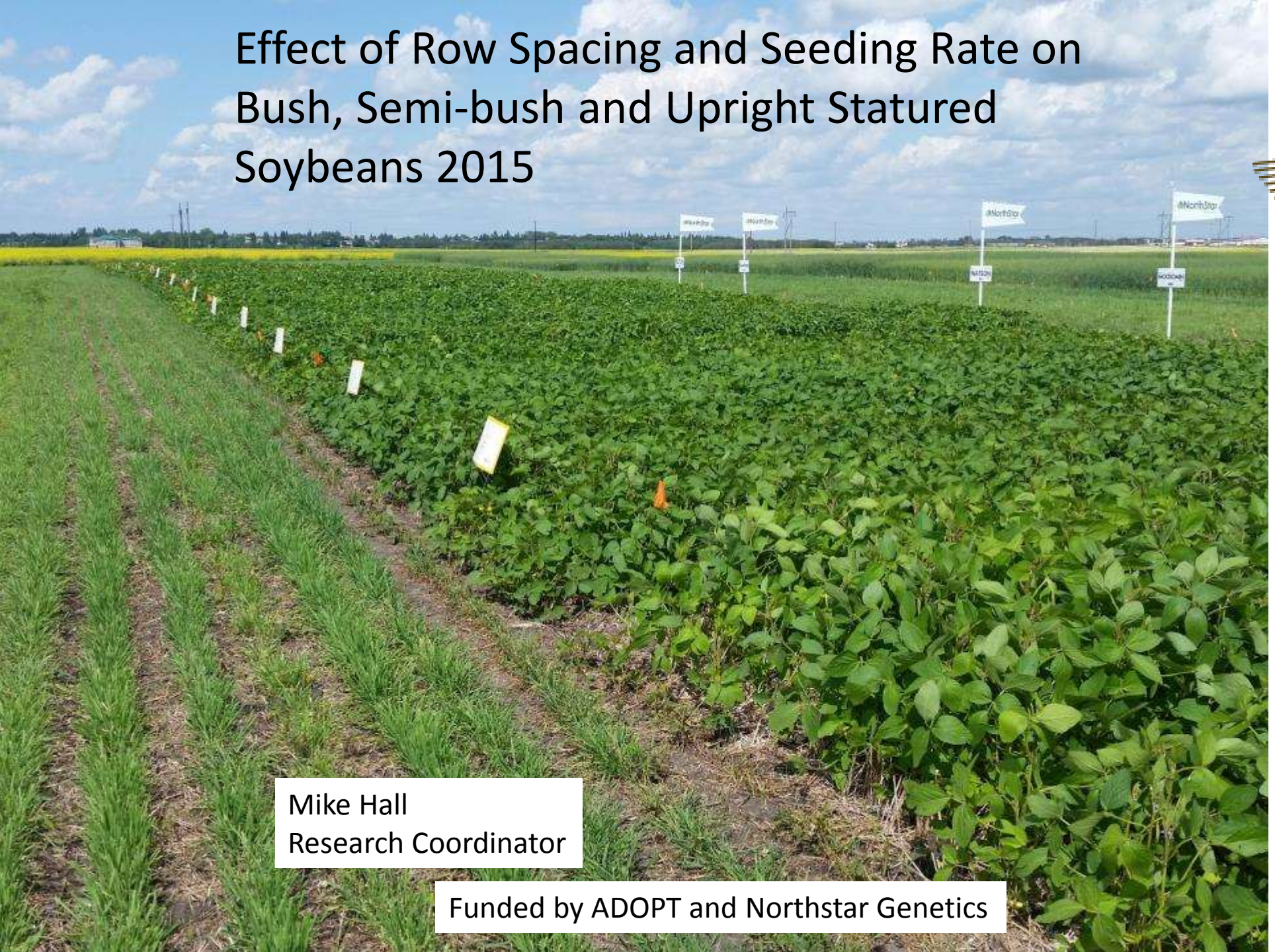
- Granular inoculant performed well
- on seed inoculant did not perform well (handling issue?).
- As a result, could not show a benefit to dual inoculation

Bushy soybeans perform better at wide row spacings.

Why even consider wide row spacing?

- Have access to planter
- Seeding rate can be reduced at wider row spacing. (Seed cost savings)
- White mold?

Effect of Row Spacing and Seeding Rate on Bush, Semi-bush and Upright Statured Soybeans 2015



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Funded by ADOPT and Northstar Genetics

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Soybean Varieties

- NSC Tilston RR2Y (Erect)
- NSC Anola RR2Y (Semi-bushy)
- NSC Gladstone RR2Y (Bushy)

Target populations

- 175,000 plants/ac
- 200,000 plants/ac

Row spacings

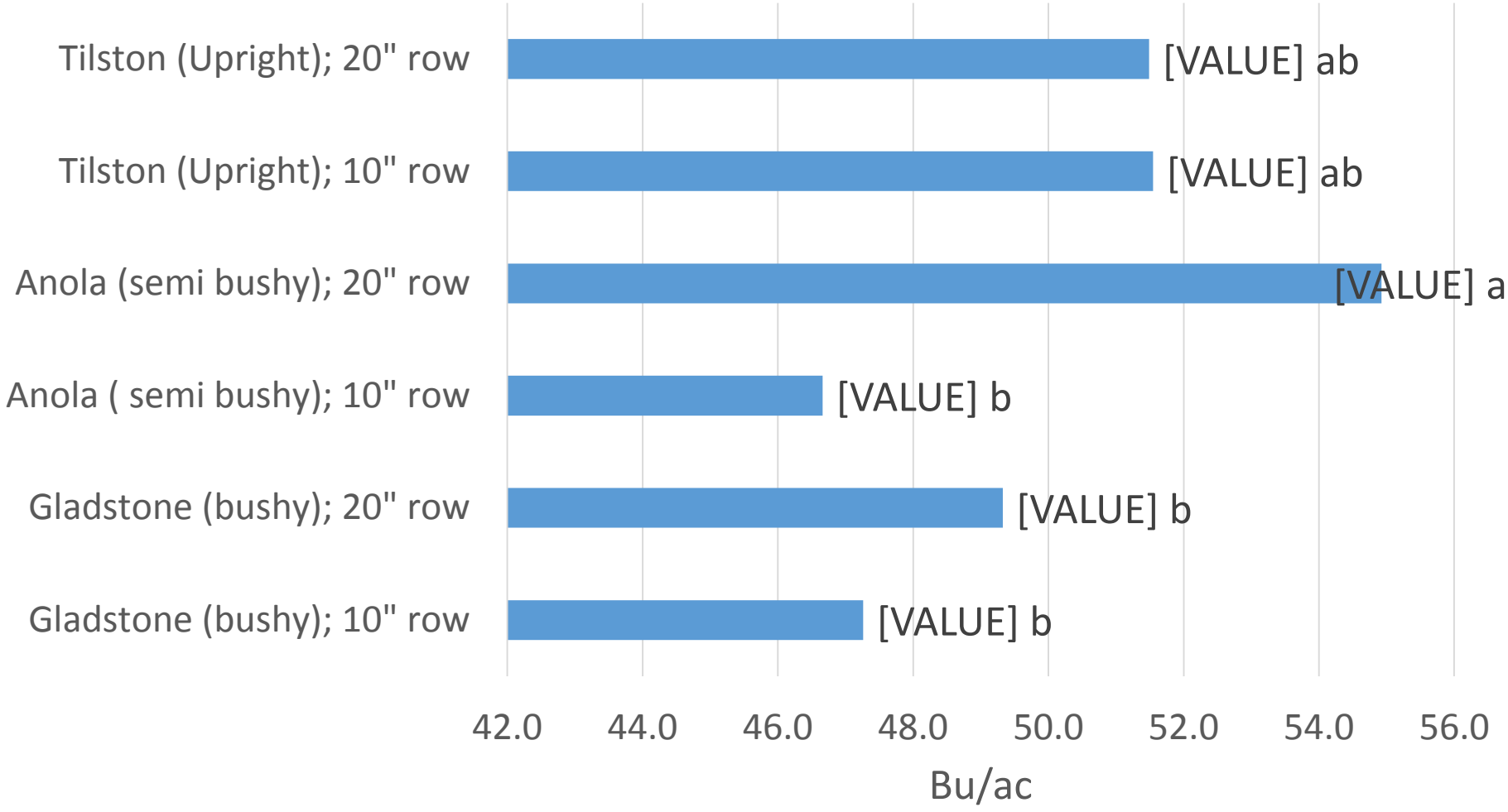
- 10 inches
- 20 inches

Targeted Versus Actual plants/ac for each Variety

Variety	Target 175,000 pl/ac	Target 200,000 pl/ac
NSC Tilston	167,000	187,000
NSC Anola	165,000	182,000
NSC Gladstone	187,000	200,000

Affect of Soybean variety and row spacing on yield averaged over plant populations.

Treatment means followed by the same letter are not statistically different p=0.05.



Bushy soybean varieties will perform better at wider row spacings.

- There was some evidence for bushier soybeans to yield better at 20 versus 10 inches. However, they didn’t necessarily out yield an erect variety.
- Soybeans can be produced well on 10 inch and didn’t see a strong reason to move to 20 inches.

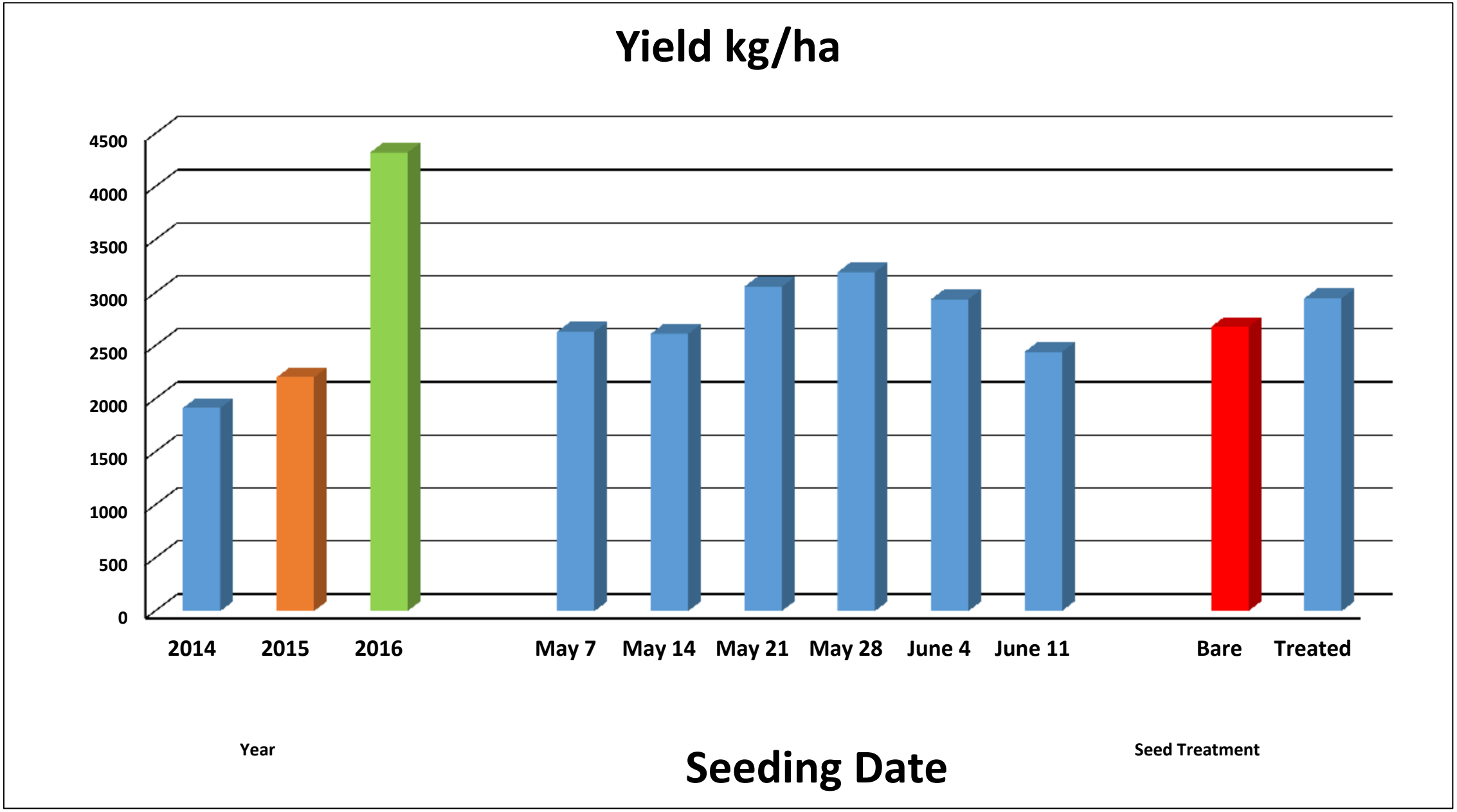
Conclusions

- Fall cultivation may benefit early seeded soybeans by providing a warmer start to the year and reducing the risk of early season frost. However, that practice needs to be considered soil conservation issues.
- Couldn’t demonstrate that early seeding could result in seed shock and reduced yield. Soils were warm in early May and early seeded soybean were never harmed by late frost. BUT IT COULD HAPPEN! Was able to demonstrate issues with late seeding. Ideal time is mid to late May.
- Granular inoculant performed really well. Seed applied inoculant did not perform well. Wondering if the seed was mishandled. As a result couldn’t demonstrate the benefit of dual inoculation.
- Bushy soybeans can perform better at wider row spacing of 20 inches but yield still comparable to a solid seeded erect variety.

Funded By

- Agricultural Demonstration of Practices and Technologies (ADOPT)

Figure 8. Impact of Trial Year, Seeding Date and Chemical Seed Treatment on Soybean Yield, 2014-16 ICDC.



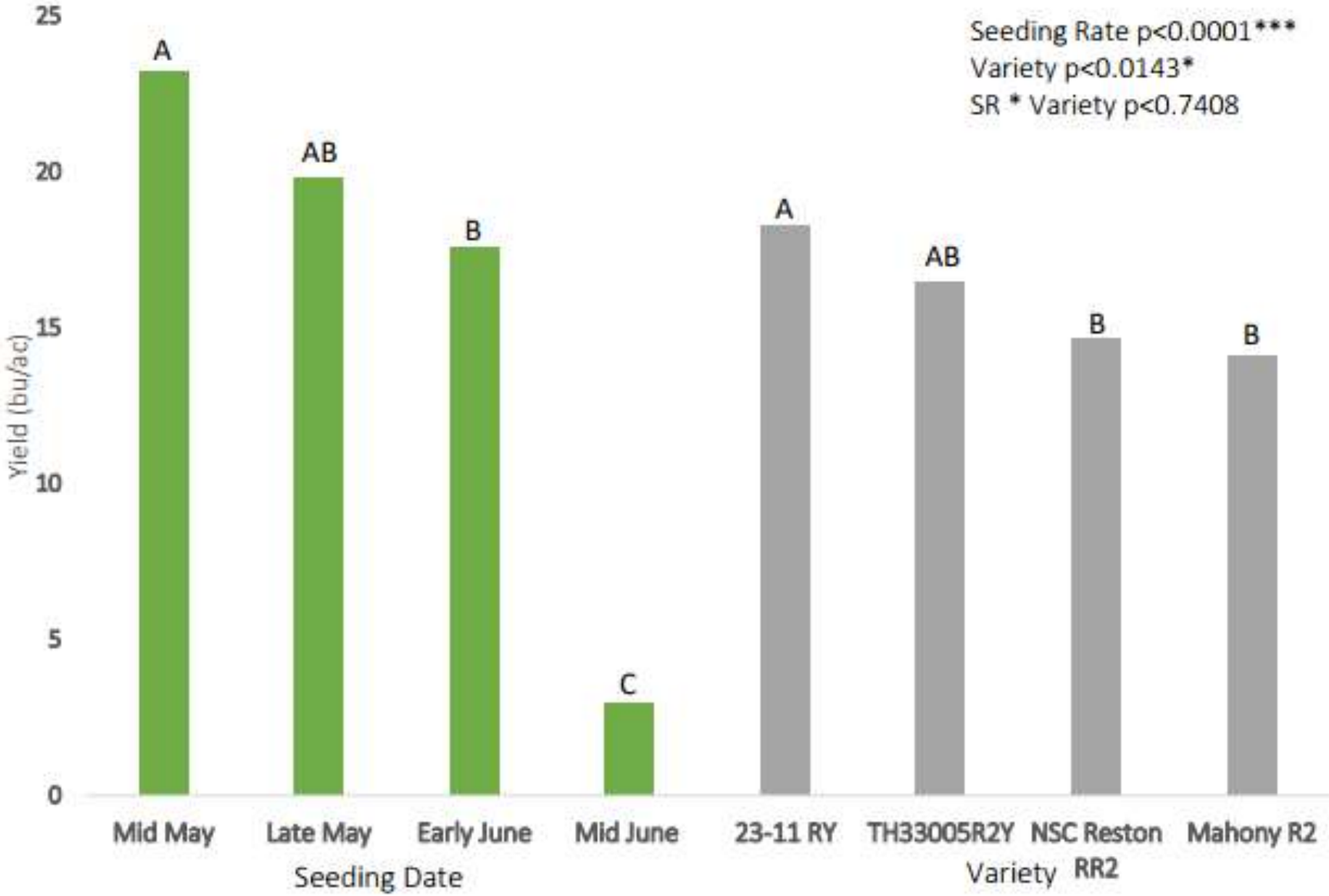
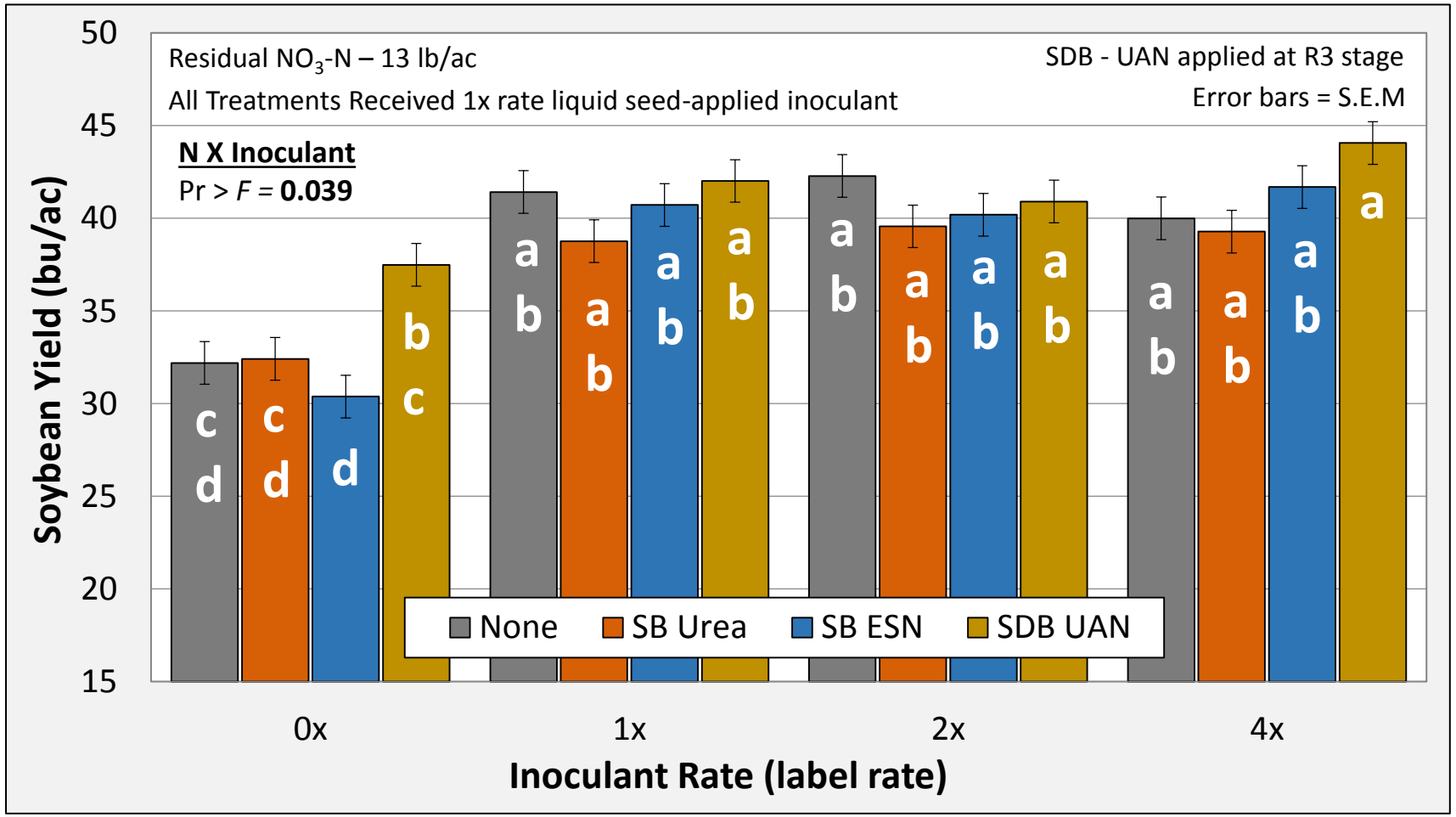
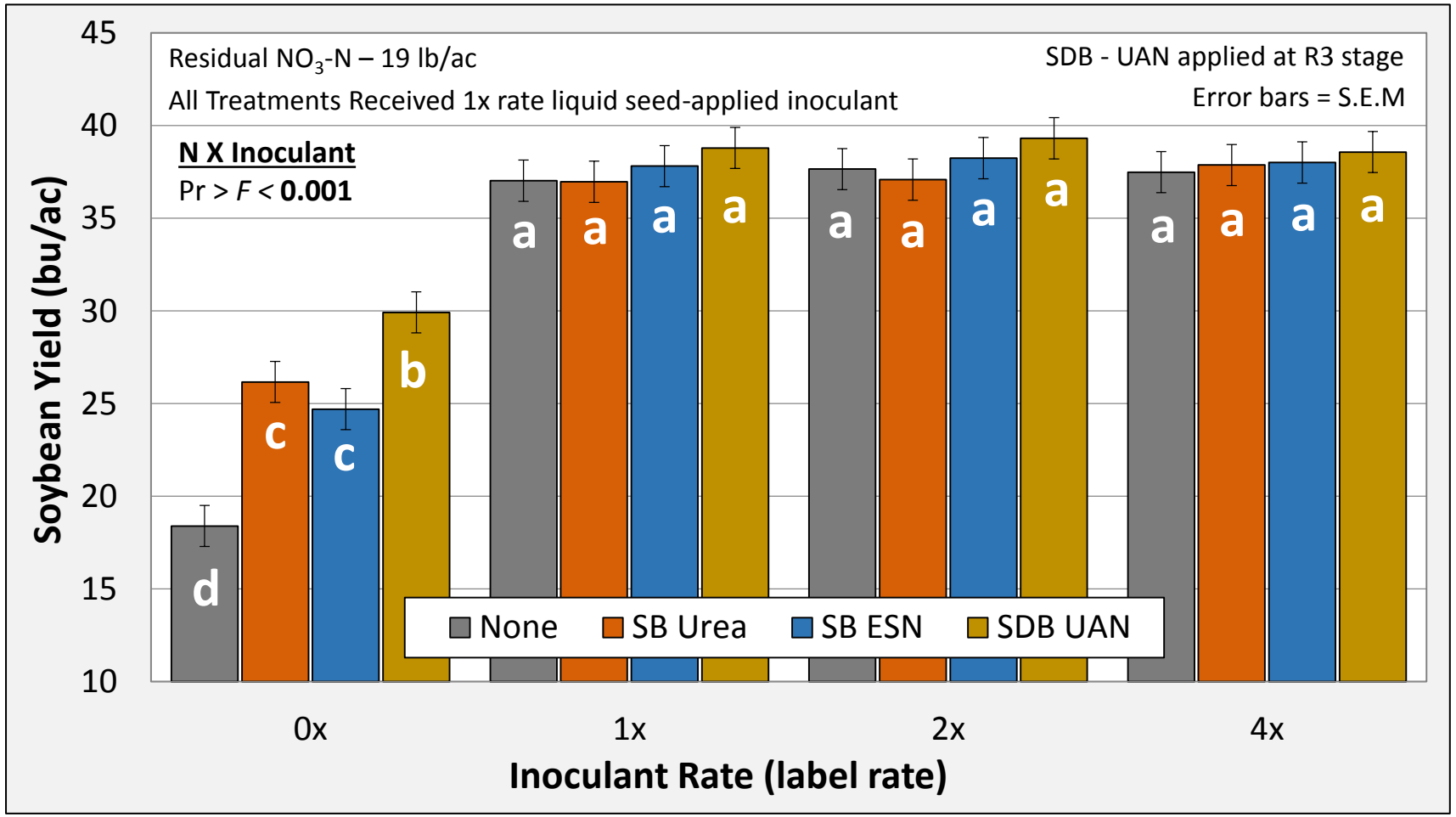


Figure 2: Effect of Seeding Date and Variety on Soybean Yield (kg/ha) in Melfort, 2017.

Inoculant x N Interactions for Soybean Seed Yield (Indian Head - 2015)



Inoculant x N Interactions for Soybean Seed Yield (Indian Head - 2016)



Soybean Nitrogen Management
Conclusions

- Effective nodulation is critical to meet the N demands of high yielding soybeans & most SK field trials in SK show benefits to double application
- As soybeans become well established in crop rotations, likelihood of yield benefits from dual inoculation is expected to diminish
- Starter N (side-banded) increased above-ground biomass with reasonable consistency but, to date, only increased yield at 2/6 site-years and when inoculation was inadequate (i.e. no granular inoculant applied)
  - Late season N (R3 stage) was the most effective to recover yield loss w/poor nodulation
  - 16-79% yield increases over control, up to 79-91% of dual-inoculated yields (Indian Head)
  - Starter N also helped recover yield loss associated with inadequate inoculation in 2016 at Indian Head but high residual NO_3-N levels can inhibit nodulation in pulses so be cautious
- Greater potential for starter N benefit when residual levels extremely low? Sandy, low organic matter soils?
- Always assess nodulation, regardless of field history or inoculation methods
  - Look for at >5 healthy nodules/plant at R1 growth stage (gives time to address deficiency)
  - When nodulation is poor, 50 lb N/ac applied at R3 can mitigate some yield loss