Corn Hybrid Response to Starter Fertilizer

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Outline

// Background for starter fertilizer in corn

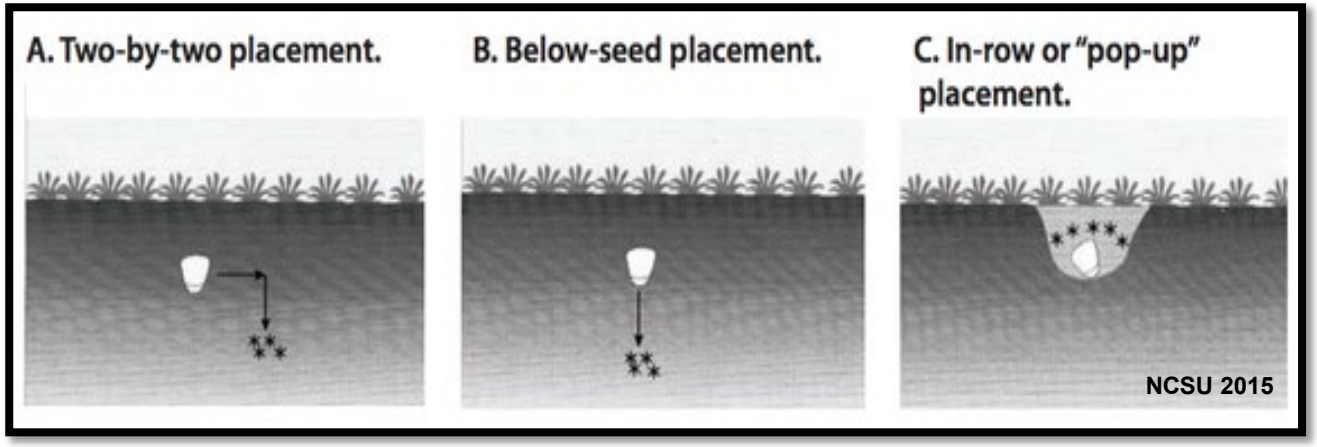
// Experimental Design

// Results: Field studies for 2017-2019

Background

Starter fertilizer benefits for corn

- Nutrients placed close to the seed at planting
- Recommend when planting into cooler soil temperatures



Background

Starter fertilizer benefits for corn (Rogalsky 2016)

// **Increased early season biomass: up to 110% at V4**

MAP 27 lb P_2O_5/acre

No P Check

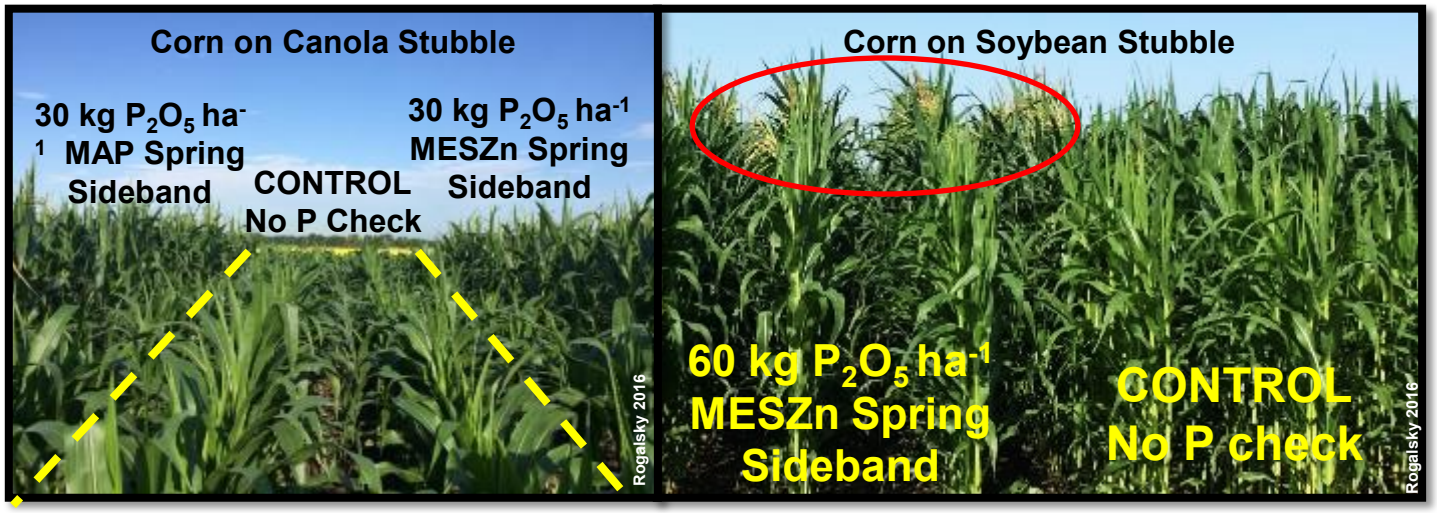
P deficiency symptoms at V3

Background

Starter fertilizer benefits for corn (Rogalsky 2016)

// Hastening of maturity

// Grain yield increase



Background

Effect of hybrid on response to starter fertilizer

- Teare and Wright (1990)
  - 21 hybrids: 8 had positive yield response to SF and 13 had negative or no yield response to starter fertilizer

- Gordon and Pierzynski (2006)
  - 4 hybrids: All 4 hybrids had increased early season growth with SF
    - Only 2/4 hybrids had reduced days to silking, lower grain moisture and increased grain yield

- Buah et al., 1999
  - 12 hybrids: All corn hybrids responded similarly SF

Experimental Design for Manitoba Studies

Hybrids

- DKC23-17RIB (2075 CHU)
- DKC26-28RIB (2150 CHU)
- DKC26-40RIB (2150 CHU)
- DKC27-55RIB (2200 CHU)
- DKC30-07RIB (2350 CHU)
- DKC30-19RIB (2300 CHU)
- DKC32-12RIB (2450 CHU)
- DKC33-78RIB (2400 CHU)

Treatments

Study 1 – Starter N+P

- Control: No starter
- APP (10-34-0)
  - 5 gal/ac ~20 lbs P_2O_5/ac
    ~6 lbs N/ac

Study 2 –Starter P Only

- Control: No Starter P but 6 lbs N/ac as UAN pre-emergence
- APP (10-34-0)
  - 5 gal/ac ~20 lbs P_2O_5/ac
    ~6 lbs N/ac

Site Information

Site year	Previous crop	Olsen P (ppm)	P2O5 broadcast (lbs/ac)
Carberry 2017	Potato	38.5 (v. high +)	0
Oakville 2017	Soybean	N/A	30
Roland 2017	Canola	5 (low)	70
Winnipeg 2017	Oats	13.5 (med)	0
Homewood 2018	Soybean	13 (med)	0
Kane 2018	Soybean	21 (v. high +)	0
Oakville 2018	Soybean	10 (low)	0
Portage 2018	Oats	22 (v. high +)	0
Oakville 2019	Soybean	24.5 (v. high +)	0
Portage 2019	Oats	25.5 (v. high +)	0
Roland 2019	Oats	21 (v. high +)	0
Winkler 2019	Canola	14 (med)	0

Site Information

Sites lost due to wind or drought

Site year	Previous crop	Olsen P (ppm)	P2O5 broadcast (lbs/ac)
~~Carberry 2017~~	~~Potato~~	~~38.5 (v. high +)~~	~~0~~
Oakville 2017	Soybean	N/A	30
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Oakville 2019	Soybean	24.5 (v. high +)	0
Portage 2019	Oats	25.5 (v. high +)	0
~~Roland 2019~~	~~Oats~~	~~21 (v. high +)~~	~~0~~
Winkler 2019	Canola	14 (med)	0

Early Season Biomass

V4-V6

Starter N+P (Study 1)

Treatment	Biomass (lb/ac)
No starter	167
Starter N+P	182*

Type III Test of Fixed Effects				
Effect	DF	Den DF	F Vale	Pr>F
trt	1	35.4	16.31	0.0003
siteyr*trt	6	35.4	0.91	0.5016
trt*hybrid	7	475	1.81	0.0834
siteyr*trt*hybrid	42	474	1.29	0.1108

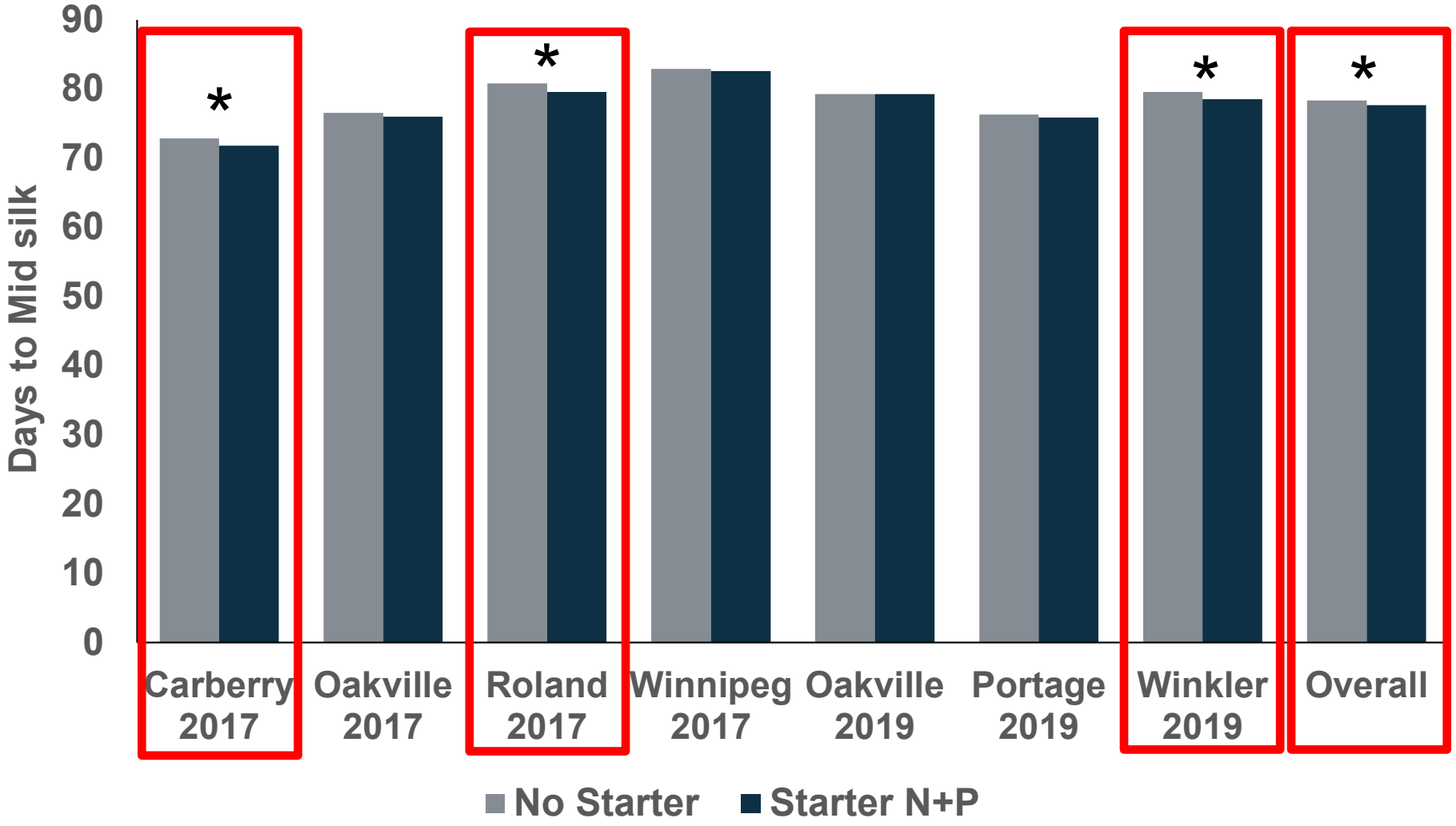
Starter P (Study 2)

Treatment	Biomass (lb/ac)
Starter N	186
Starter N+P	195

Days to Silk–Starter N+P (Study 1)

Type III Test of Fixed Effects				
Effect	DF	Den DF	F Vale	Pr>F
trt	1	35	45.57	<.0001
siteyr*trt	6	34.9	3.09	0.0157
trt*hybrid	7	480	1.96	0.059
siteyr*trt*hybrid	42	480	1.16	0.2274

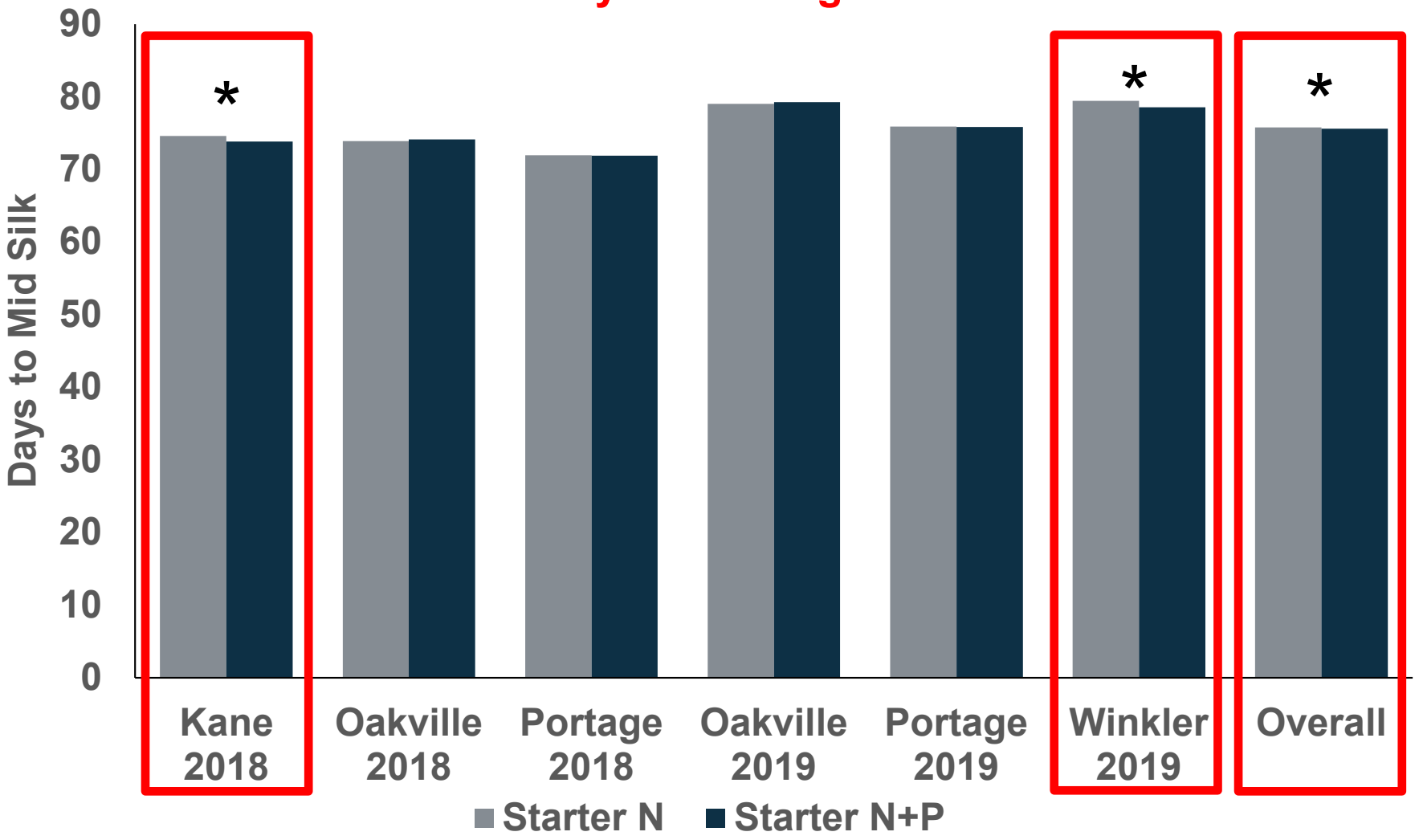
0 to 1.3 fewer days to silking



Days to Silk–Starter P (Study 2)

Type III Test of Fixed Effects				
Effect	DF	Den DF	F Vale	Pr>F
trt	1	30.7	4.87	0.035
siteyr*trt	5	30.6	4.32	0.0043
trt*hybrid	7	413	1.45	0.1846
siteyr*trt*hybrid	35	412	0.96	0.5319

0 to 0.9 fewer days to silking



Grain Moisture

- Starter N+P (Study 1)
  - Siteyr*treatment interaction

Site year	Grain MST %		Difference
	SN	SN+P	
Oakville 2017	25.8	25.5	- 0.3
Roland 2017	22.6	21.7	- 0.9*
Oakville 2019	23.5	23.8	+ 0.5
Portage 2019	26.7	27.0	+ 0.3
Winkler 2019	22.7	22.7	0

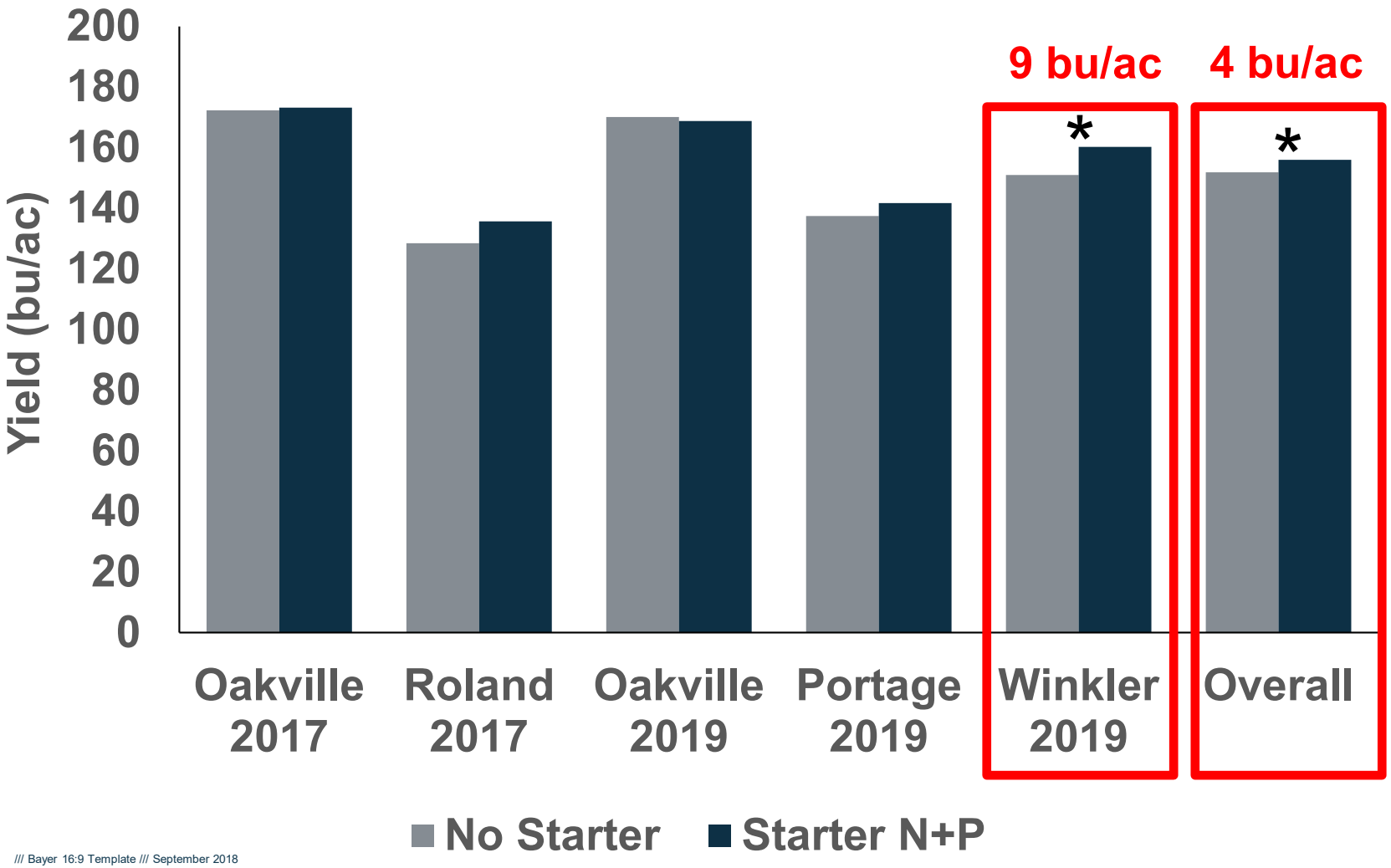
- Starter P (Study 2)
  - Siteyr*treatment*hybrid interaction
    - Portage 2018

Hybrid	Grain MST %		Difference
	SN	SN+P	
DKC26-28RIB	32.3	27.4	- 4.9*
DKC33-78RIB	25.3	30.8	+ 5.5*

Grain Yield – Starter N+P (Study 1)

Corrected to 15.5% MST

Type III Test of Fixed Effects				
Effect	DF	Den DF	F Vale	Pr>F
trt	1	26.6	15.45	0.0005
siteyr*trt	4	26.4	3.49	0.0204
trt*hybrid	7	333	2.2	0.0336
siteyr*trt*hybrid	28	333	0.65	0.9064



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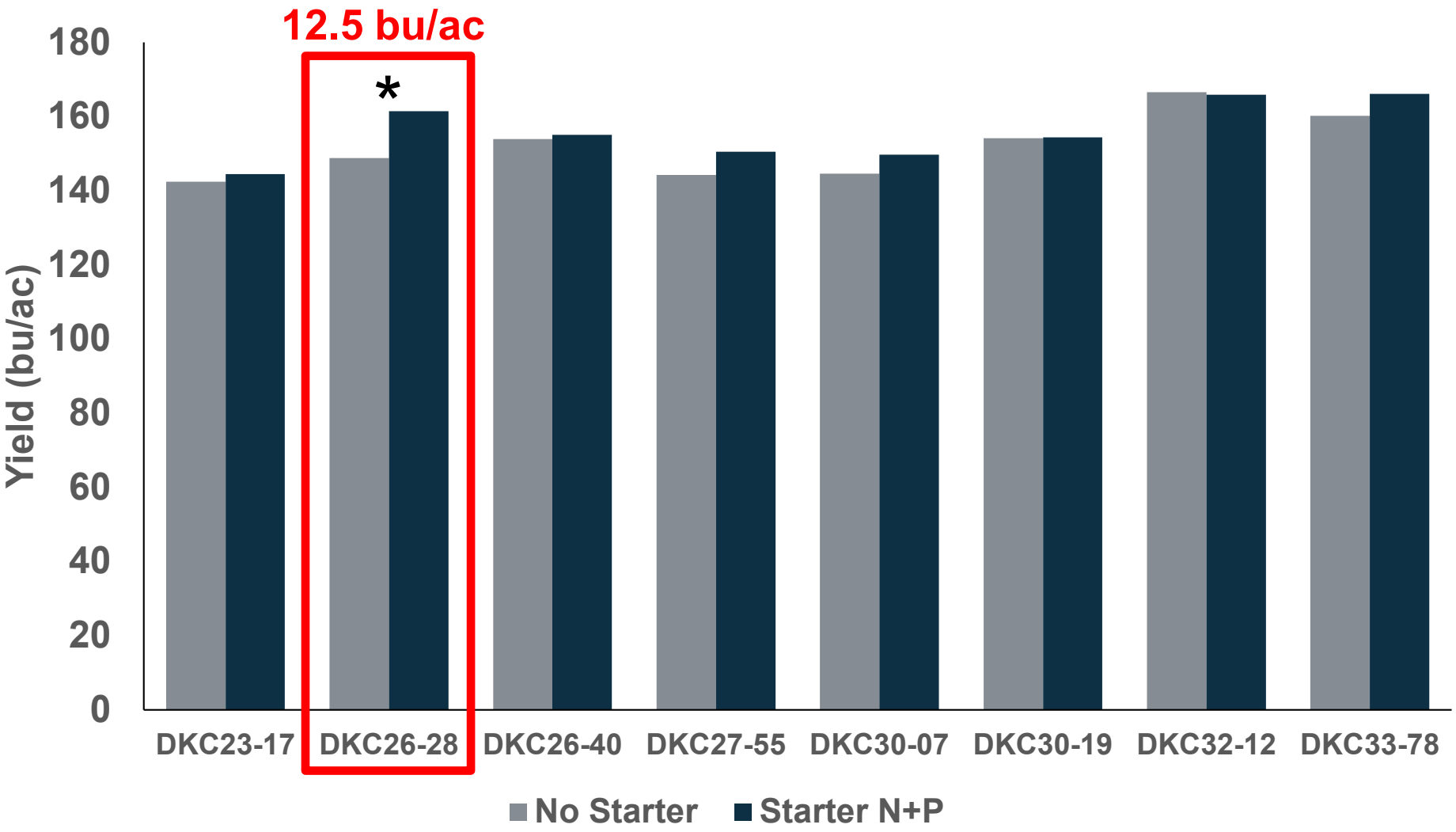

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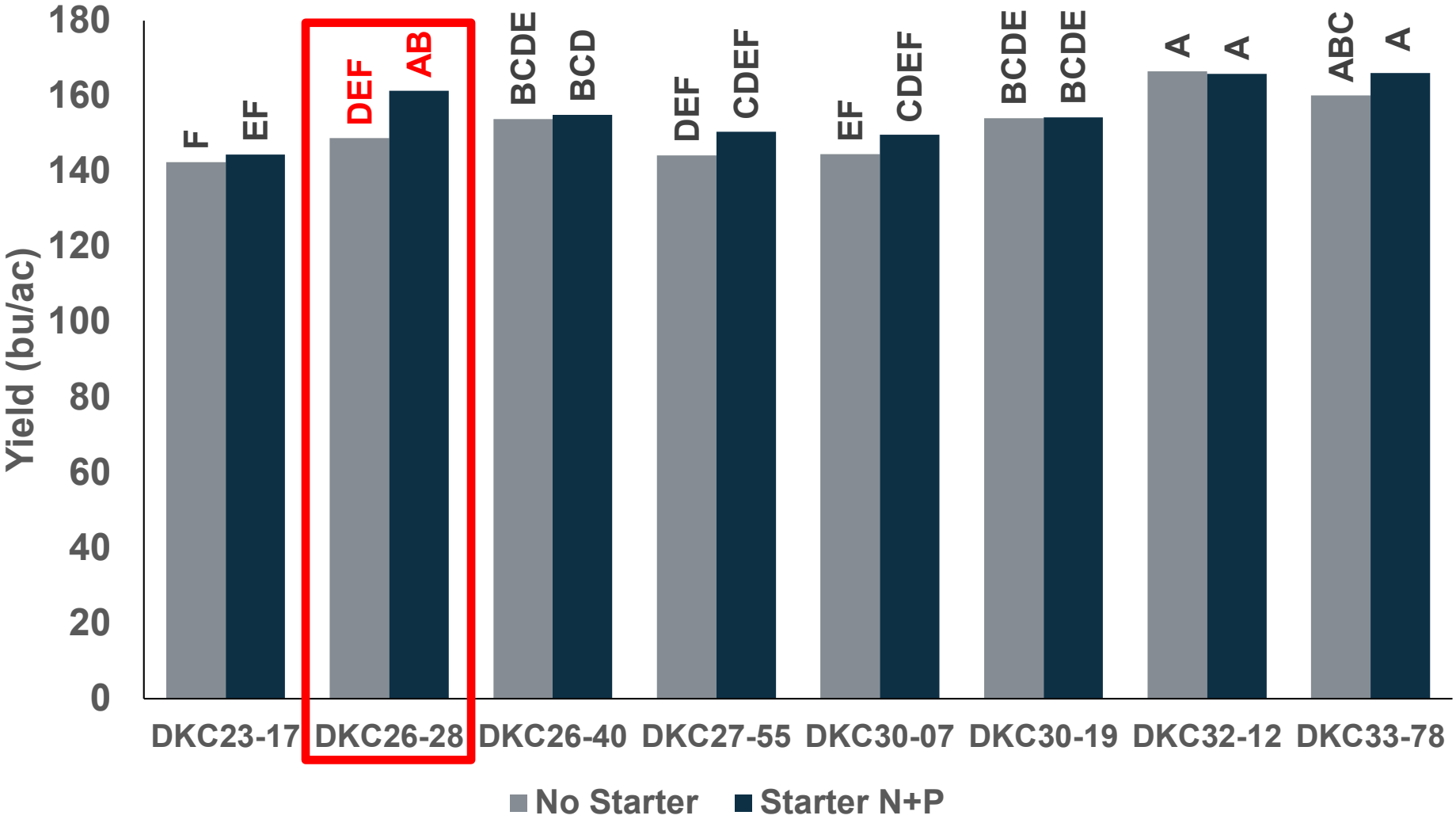
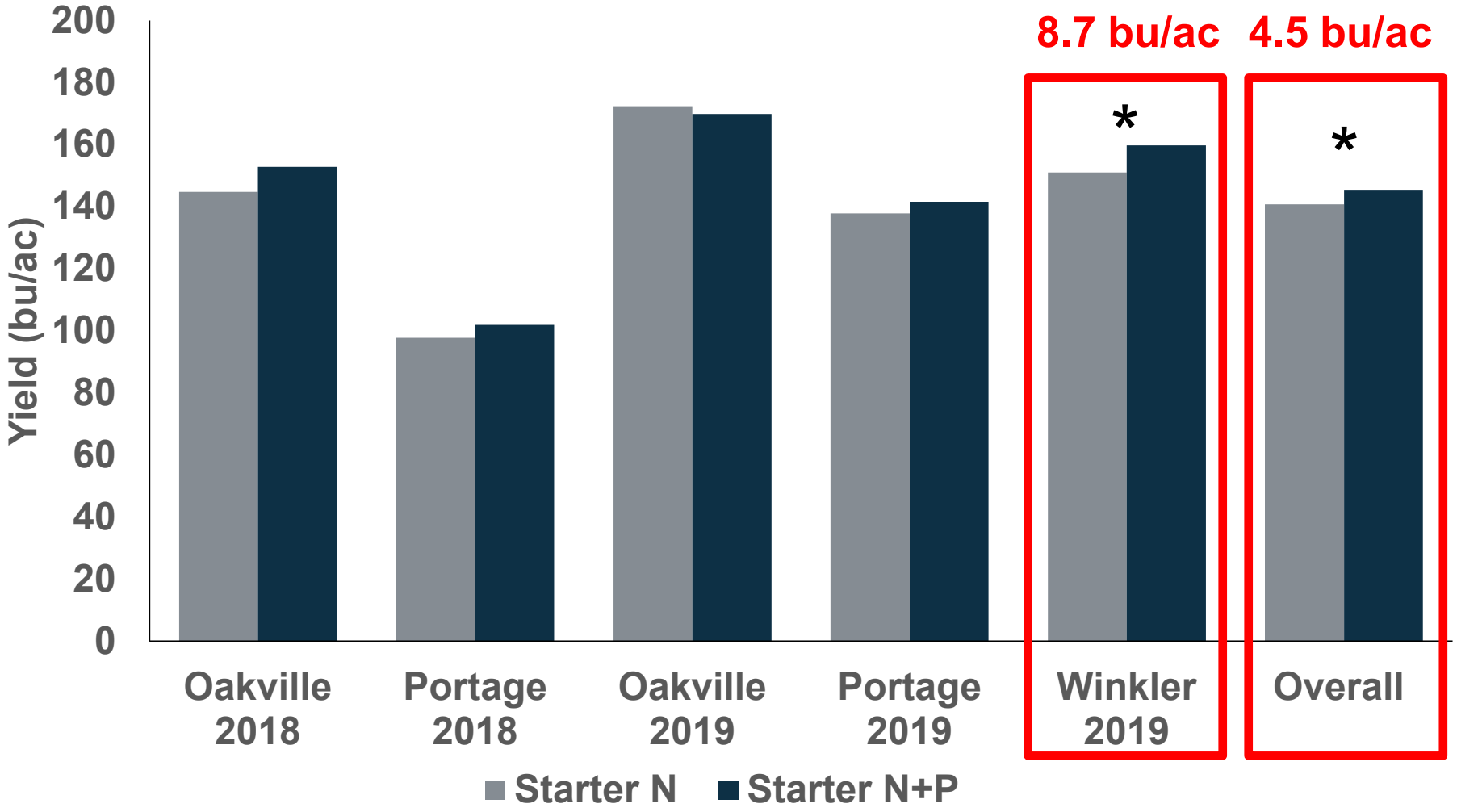


Grain Yield – Starter P (Study 2)

Corrected to 15.5% MST

Type III Test of Fixed Effects				
Effect	DF	Den DF	F Value	Pr>F
trt	1	16.5	6.98	0.0174
siteyr*trt	4	16.4	6.35	0.0028
trt*hybrid	7	326	2.92	0.0056
siteyr*trt*hybrid	28	325	0.51	0.9826



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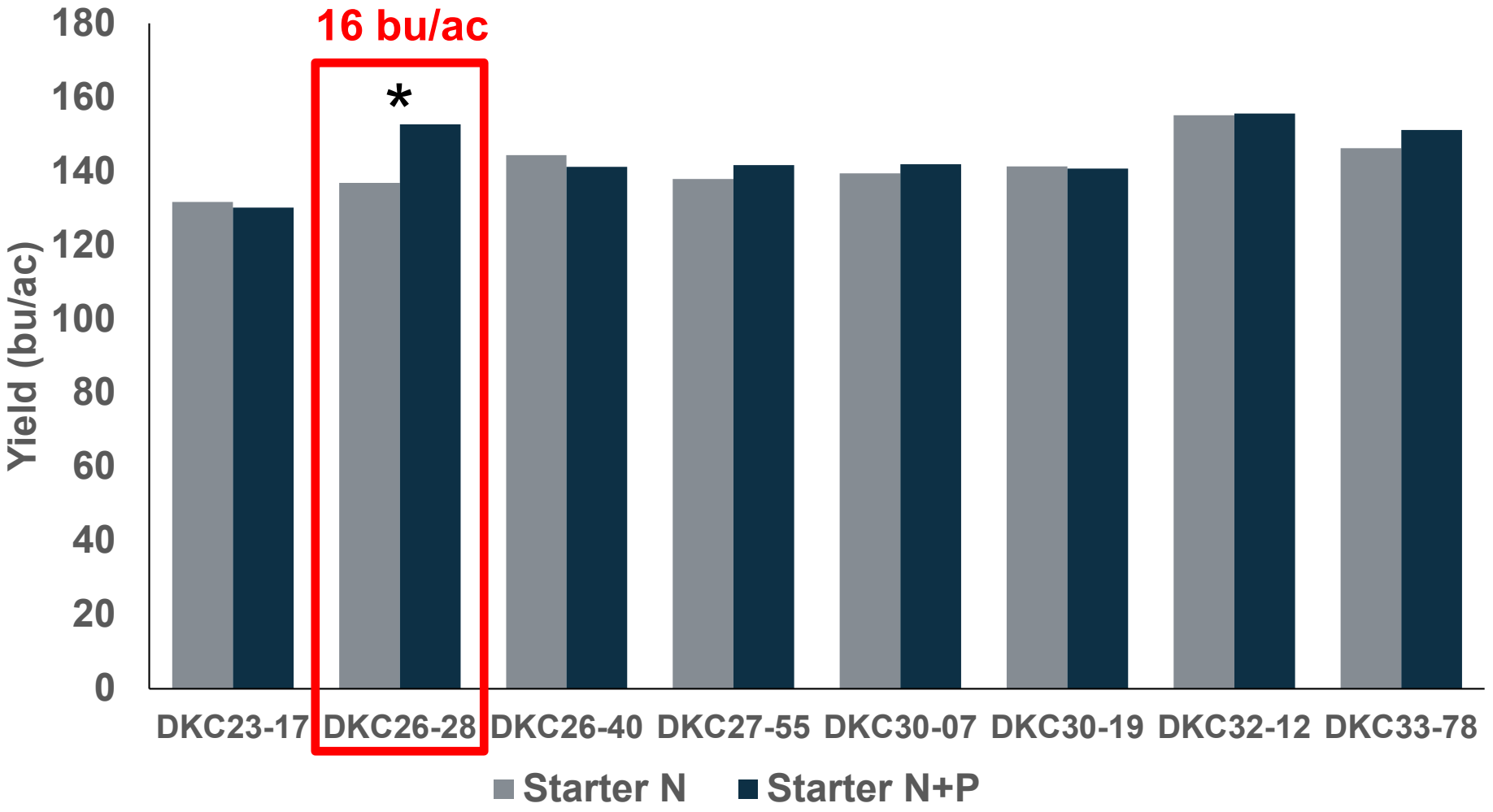

Summary

Starter N+P (Study 1)

- The addition of in-furrow N+P significantly increased early season biomass of all hybrids, across all sites
- Led to hastened physiological development
  - Reduction in days to mid silk at 3/7 site years
  - Decrease in grain moisture at 1 site year
- Grain yield increased, overall ... but:
  - significant only at Winkler 2019
  - significant only for DKC26-28RIB: +12.5 bu/ac

Summary

Starter P (Study 2)

- The addition of in-furrow P resulted in a numerical increases in early season biomass that were not statistically significant
- Led to hastened physiological development
  - Reduction in days to mid silk at 2/6 site years
- Grain yield increased, overall ... but:
  - significant only at Winkler 2019
  - significant only for DKC26-28RIB: +16 bu/ac

Summary

- Starter fertilizer for corn production is beneficial, overall
  - more beneficial to some hybrids than others
  - more beneficial in some fields and years than others
- Overall treatment benefit for days to silk and grain yield in both studies ... and early season biomass for N plus P starter only
- Cost benefits
  - $705/ MT 10-34-0
  - 5 gallon/ac cost $17
  - 4 bu/ac increase @ $5 corn = $20/ac yield increase ... plus advanced maturity and reduced grain moisture in some situations

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UNIVERSITY OF MANITOBA

Thank you!