



UNIVERSITY
OF MANITOBA

Corn Hybrid Response to Starter Fertilizer



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Outline

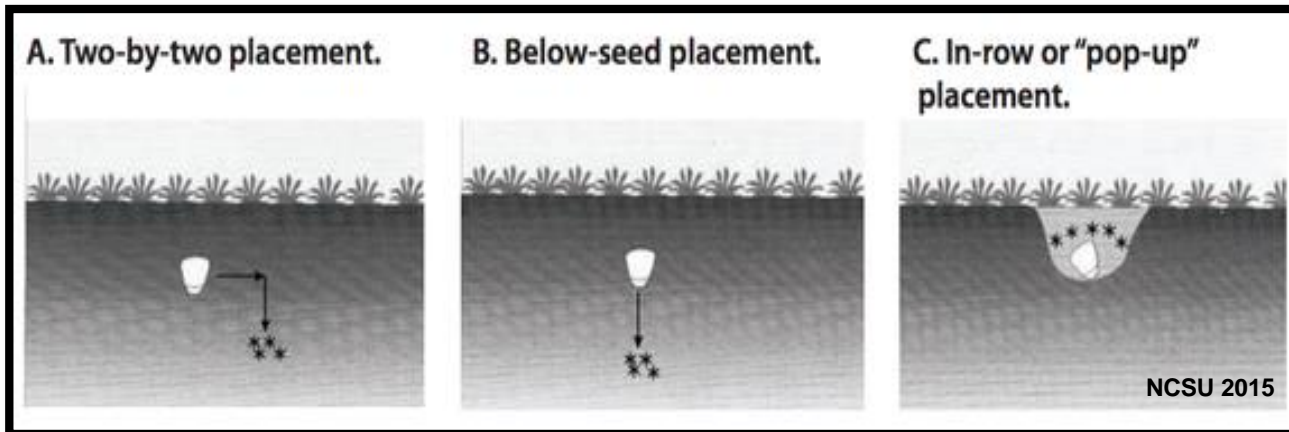
- // **Background for starter fertilizer in corn**
- // **Experimental Design**
- // **Results: Field studies for 2017-2019**



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

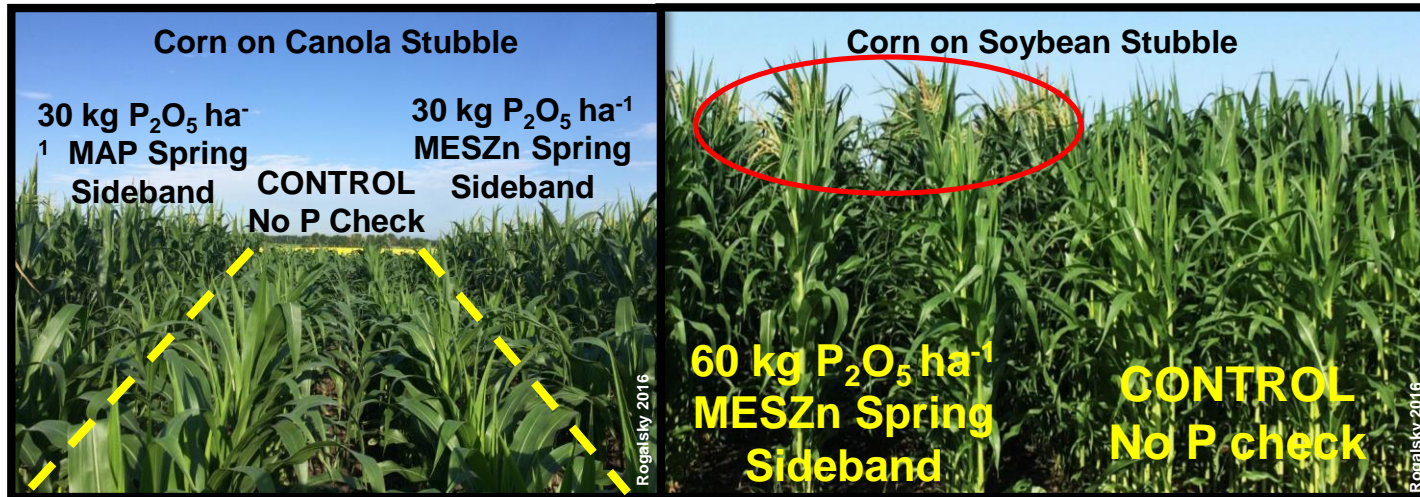


Background

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 P₂O₅/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 P₂O₅/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) |
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Early Season Biomass

V4-V6

| 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 N+P (Study 1)

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

Starter P (Study 2)

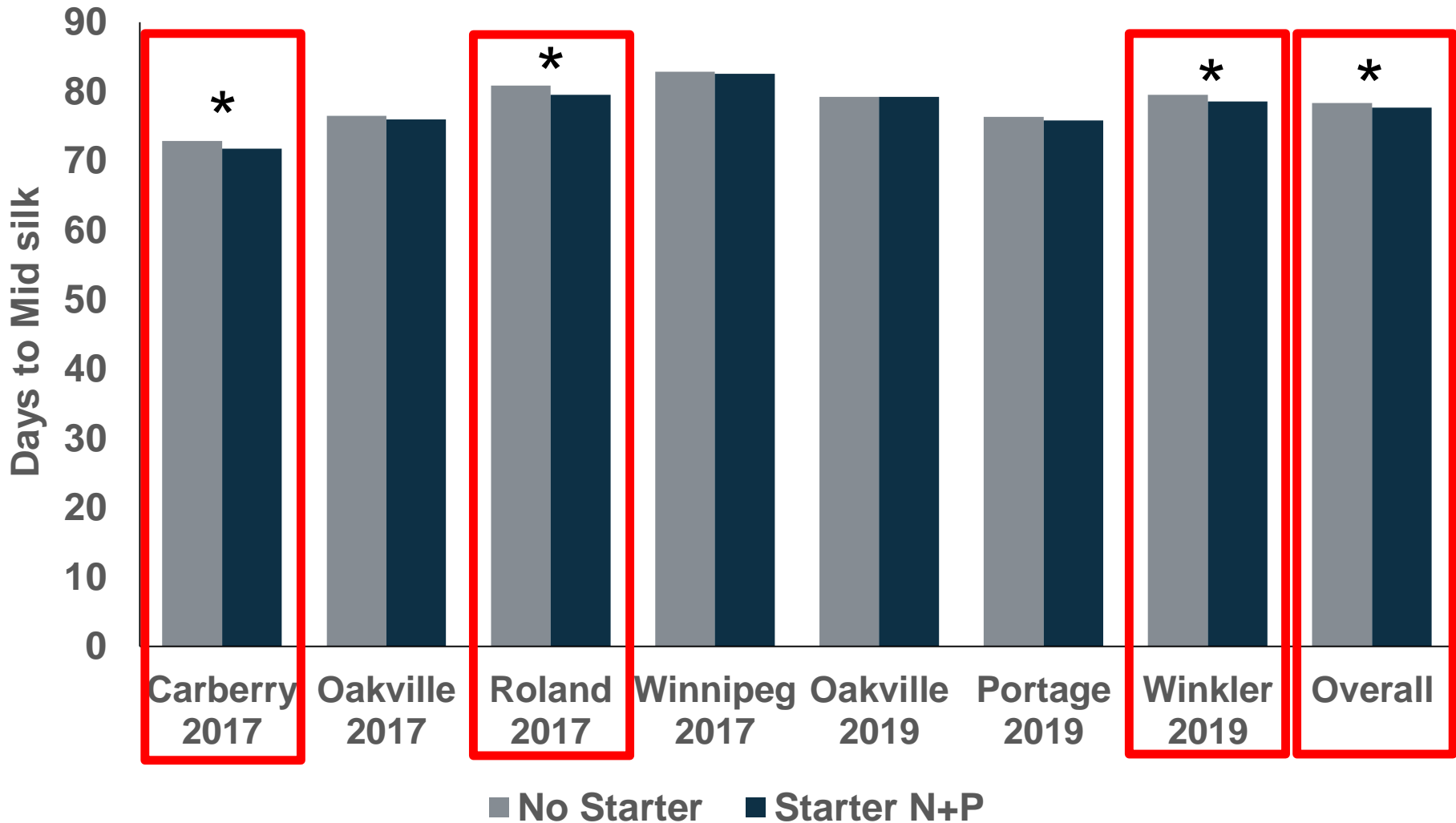
| Treatment | Biomass (lb/ac) |
|-------------|-----------------|
| Starter N | 186 |
| Starter N+P | 195 |



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

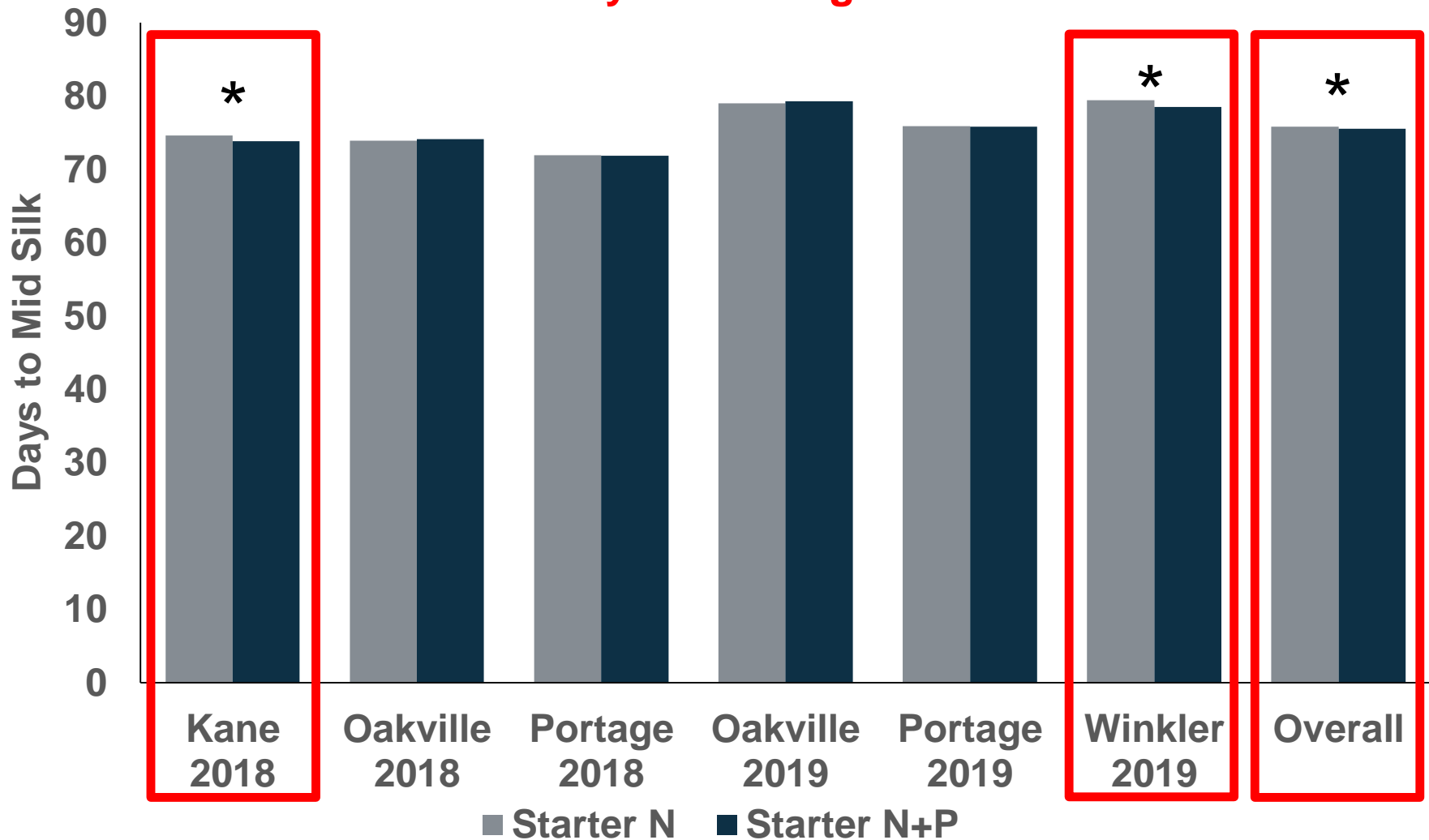




Days to Silk–Starter P (Study 2)

| 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

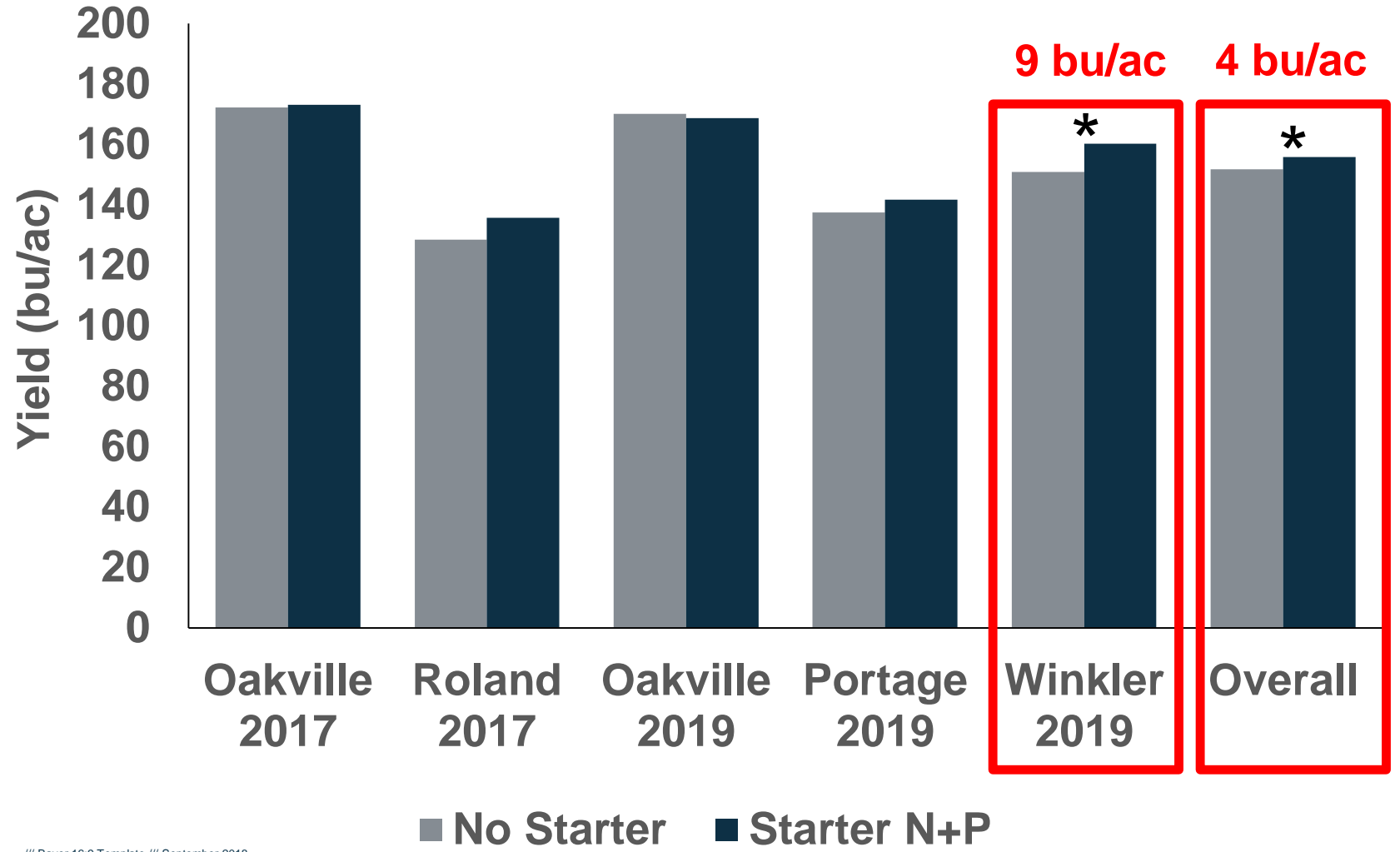
| Hybrid | Grain MST % | | Difference |
|-------------|-------------|------|------------|
| | SN | SN+P | |
| DKC26-28RIB | 32.3 | 27.4 | - 4.9* |
| DKC33-78RIB | 25.3 | 30.8 | + 5.5* |



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 |

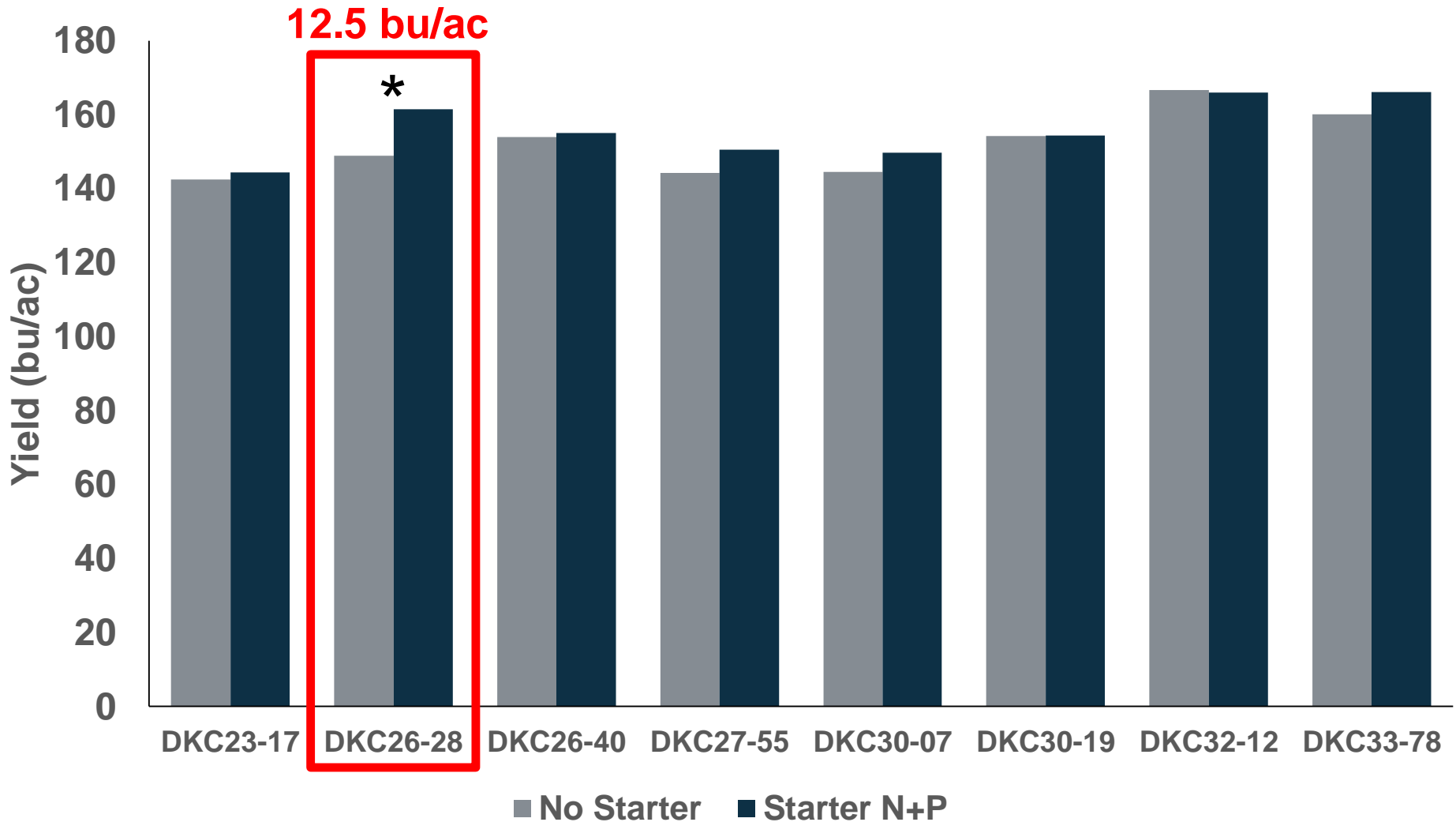




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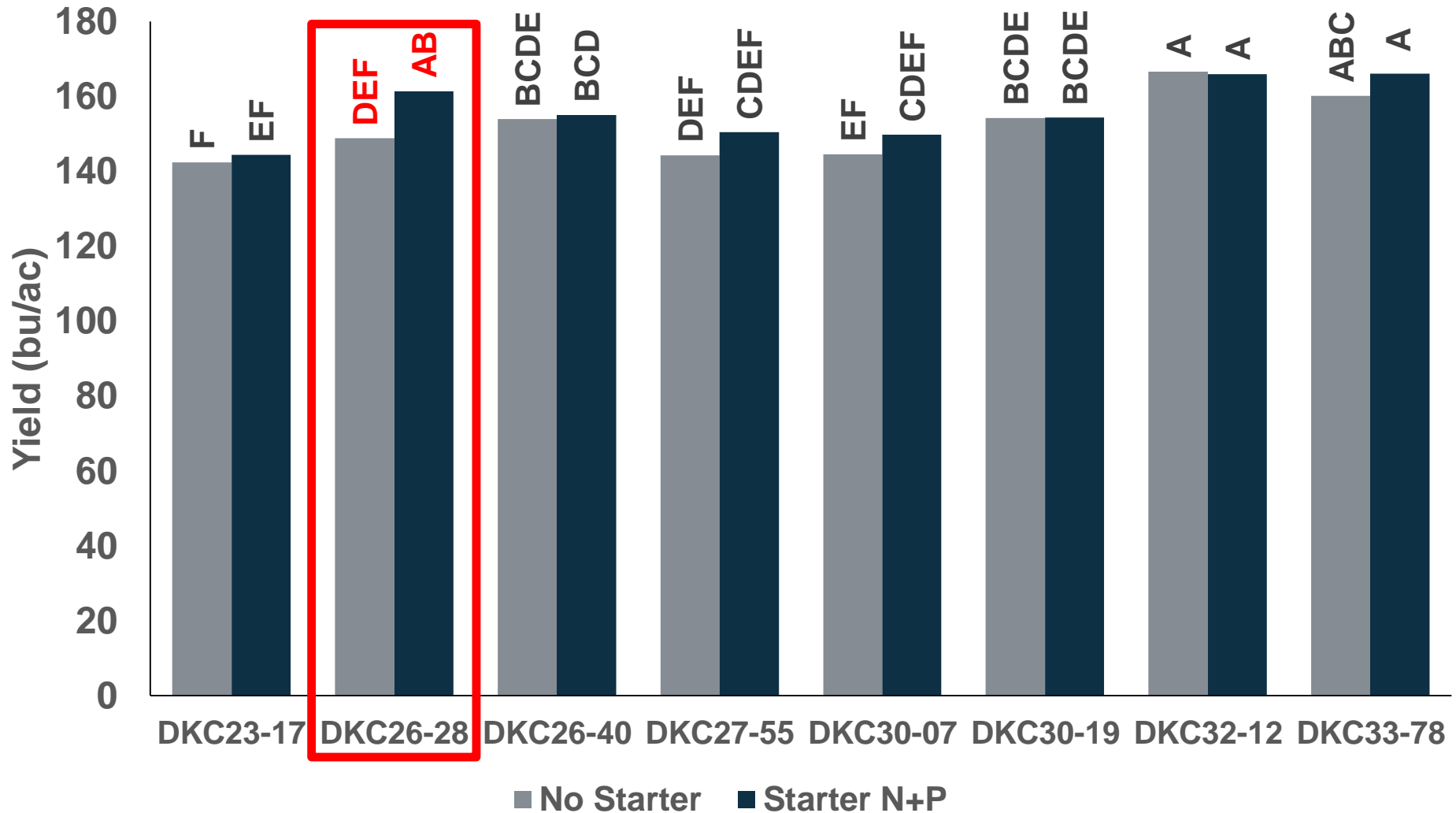




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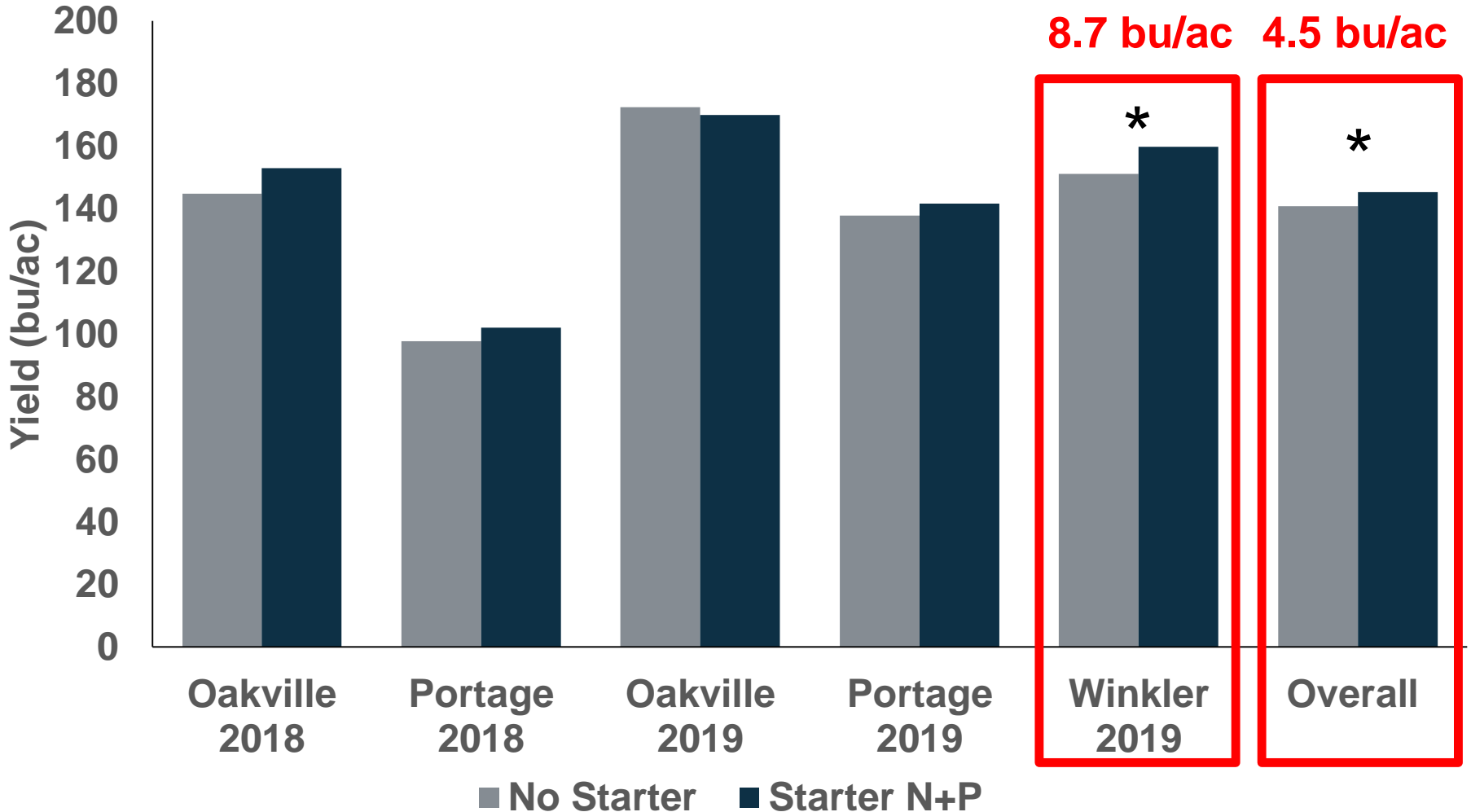




Grain Yield – Starter P (Study 2)

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 |

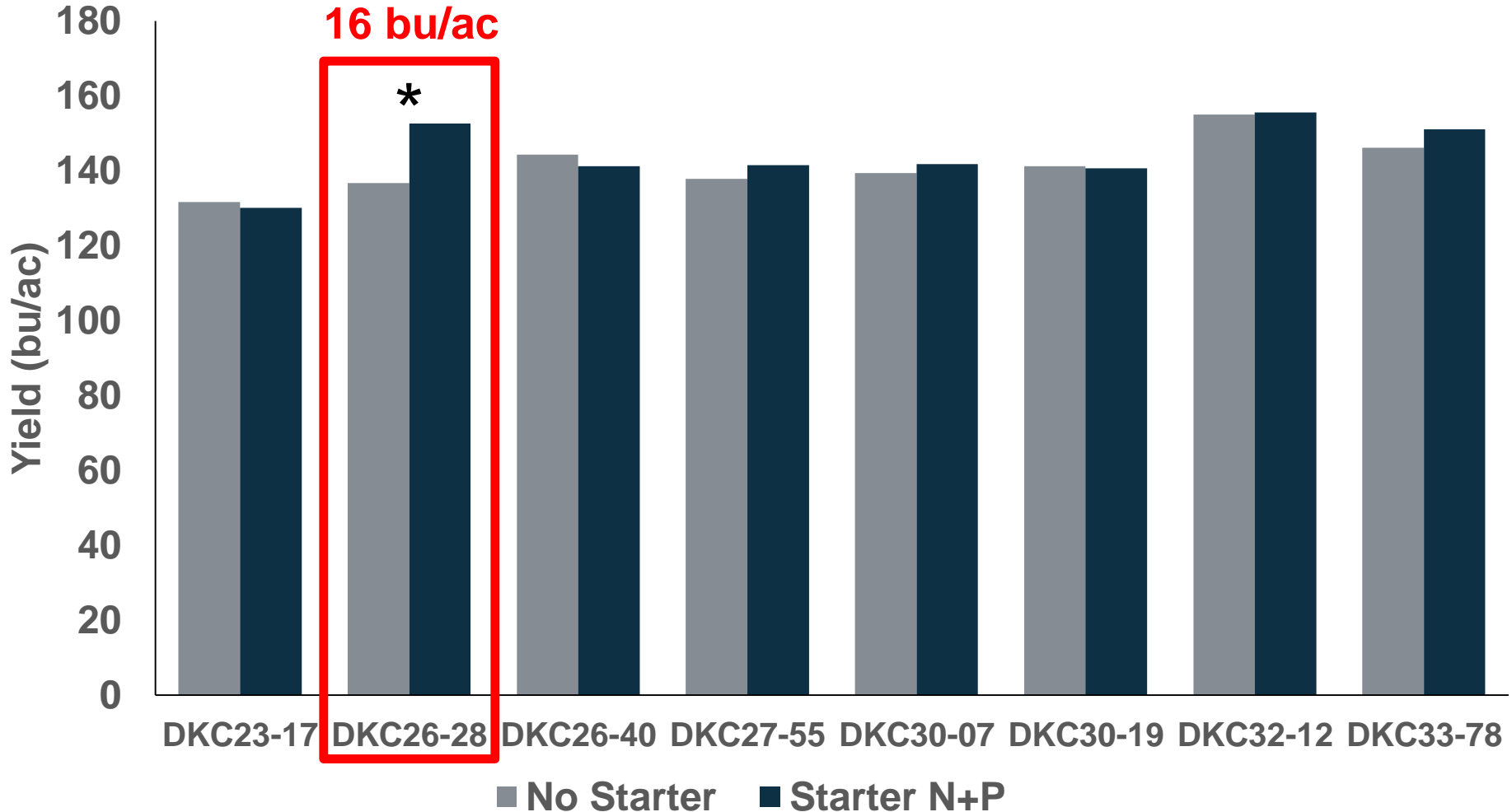




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| siteyr*trt*hybrid | 28 | 325 | 0.51 | 0.9826 |





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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Thank you!

