Soil Testing Lab Update and Late Season Nitrogen in Corn

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Services

- Soil Testing
- Plant Analysis
- Lime Testing
- Water Testing

Services

- Diagnostic Testing for agents
- Shipping Labels
- Online Payments

Common Soil Testing Mistakes

- Collect too few soil cores
- Collect cores for the wrong depth
  - pH, P, K deeper than 6”
  - N,S, Cl only 6”
- Testing for unnecessary elements

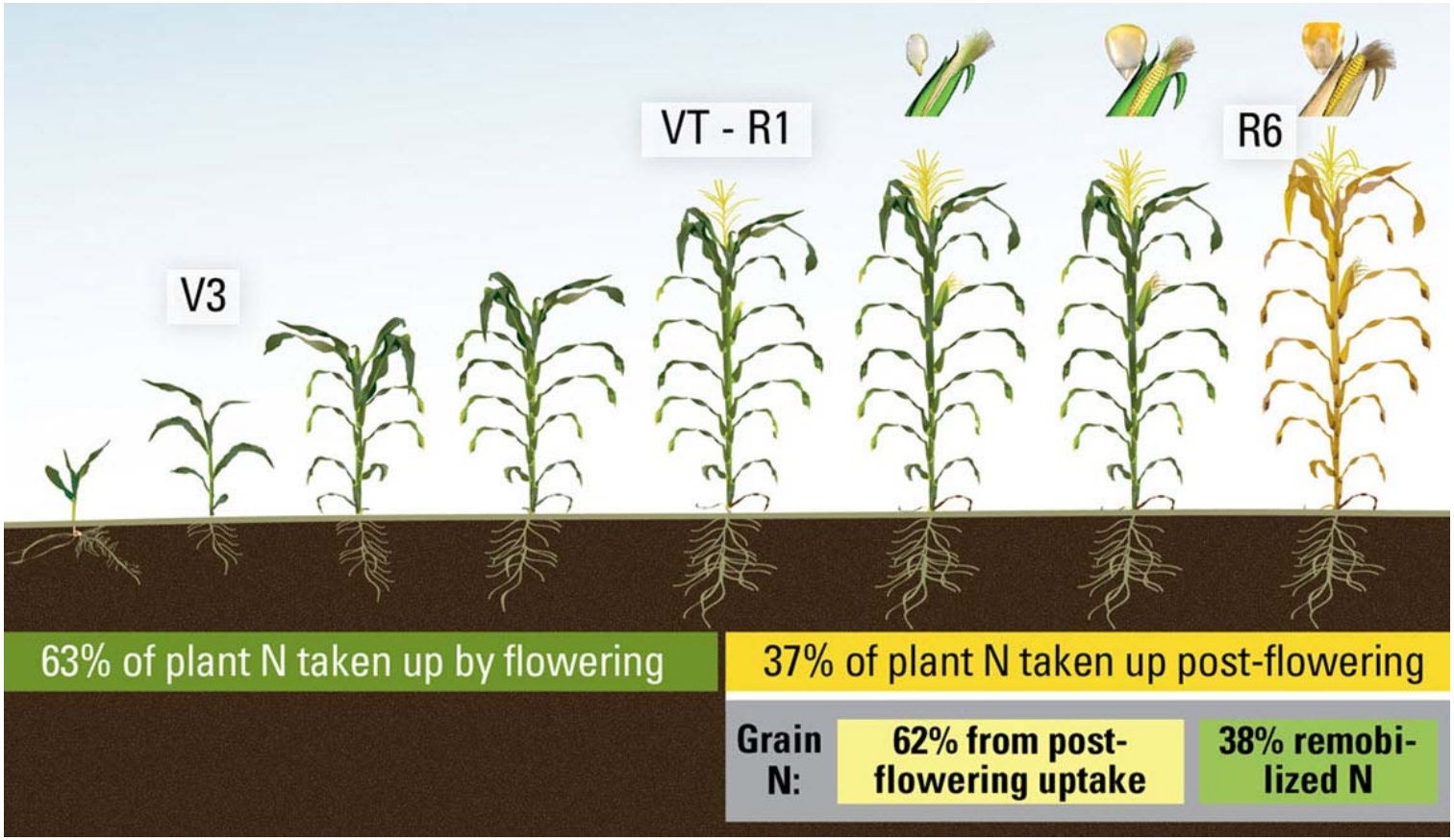
Soil Tests for Kansas Crops

Crop	pH	P	K	OM	Zn	NO3	S	Cl
	Surface					Subsoil		
Alfalfa	x	x	x				x	
Corn	x	x	x	x	x	x	x	x
Grass	x	x	x				x	
Oats	x	x	x	x		x		
Sorghum	x	x	x	x	x	x	x	x
Soybean	x	x	x		x		x	
Sunflower	x	x	x	x		x	x	x
Wheat	x	x	x	x		x	x	x

Nitrogen fertilization guidelines and late N fertilizer applications in corn

Background - Late N application

- Previous studies showed significant amount of N uptake post-flowering.



From: Jason DeBruin, DuPont Pioneer.

Late N application and fertilizer N recommendations

- The effect of late N applications on grain yield.
- Can we increase nitrogen use efficiency with late N applications?
- How this may affect fertilizer recommendations?
  - N = (yield goal x 1.6) - Soil NO_3^- - (% SOM x 20) + Previous crop adjustments

Procedures

- Four locations in 2016 (ongoing in 2017).
- Application rate based on KSU fertilizer recommendation.
  - With rates of +/- 50 lbs N/acre
- Two application times:
  1. All N fertilizer at planting
  2. Split late application with 40% of the total rate at VT-R1.

Measurements

- R1 Ear leaves for N content
- Plant and grain biomass and N content
- Yield
- Grain N content
- End of season soil profile N

Soil properties – 2016 locations

						0-60 cm		0-15 cm	
Site	County	Soil Type	Soil Texture	Previous Crop	Irrigation	NH_4-N	$N0_3$-N	pH	OM
1	Republic	Crete	Silt Loam	Soybeans	Irrigated	2	6	6.4	3.2
2	Brown	Kennebec	Silt Loam	Soybeans	Dry Land	3	5	6.8	2.3
3	Shawnee	Eudora	Silt Loam	Soybeans	Irrigated	1	3	7.2	1.3
4	Lyon	Chase	Silty Clay Loam	Soybeans	Dryland	13	3	7.2	2.9

Nitrogen application rates

Site	-50	-25	KSU Rec	25	50
	N rates (lbs/acre)				
1 – Republic	157	182	207	232	257
2 – Brown	180	205	230	255	280
3 – Shawnee	183	208	233	258	283
4 – Lyon	73	98	123	148	173

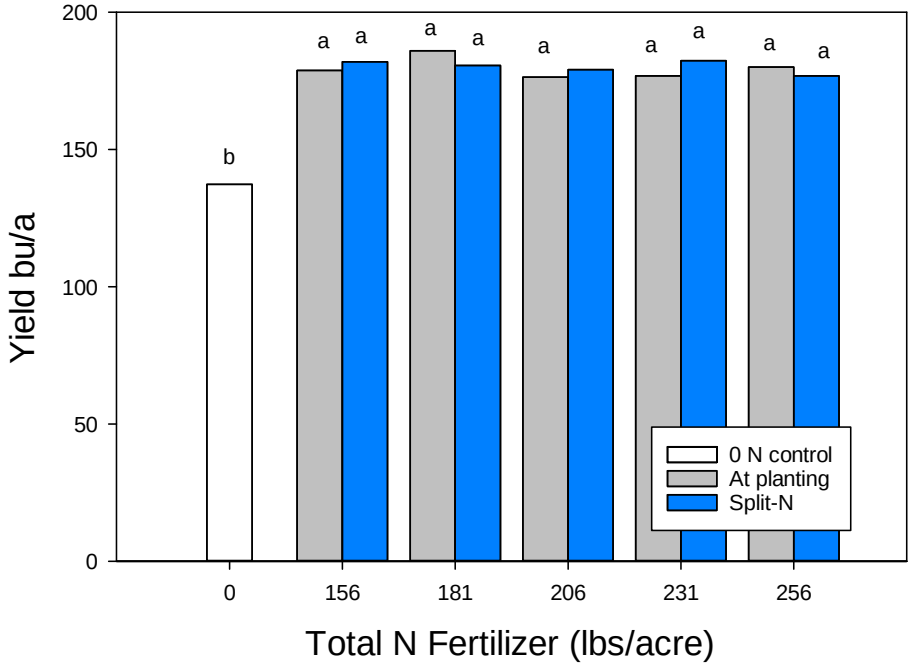
1. All N fertilizer at planting (100%)
2. Split applied at VT-R1 (60% planting – 40% VT)

Fertilizer N application

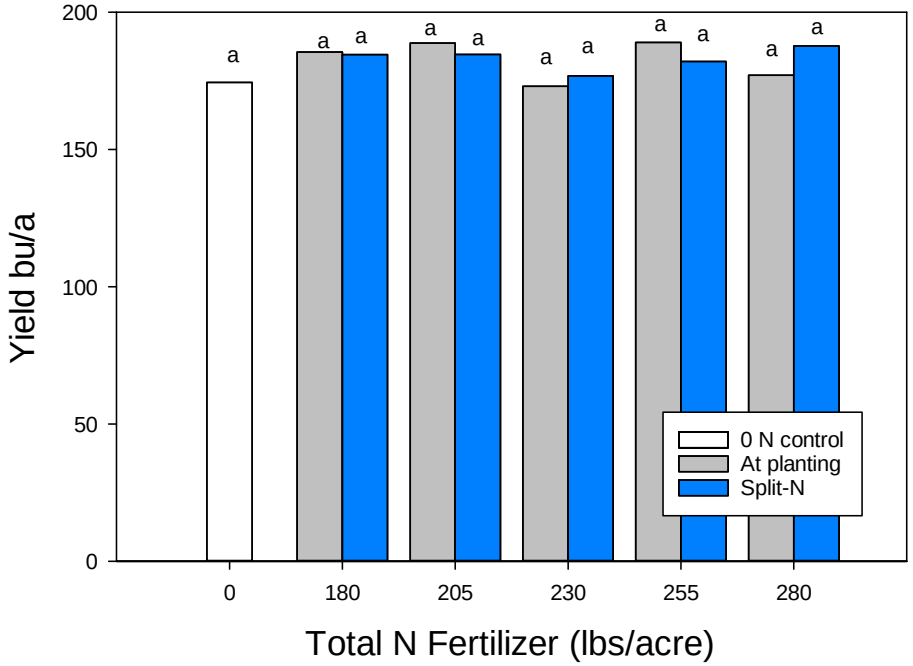
76 in clearance

Yield response by location

Location 1

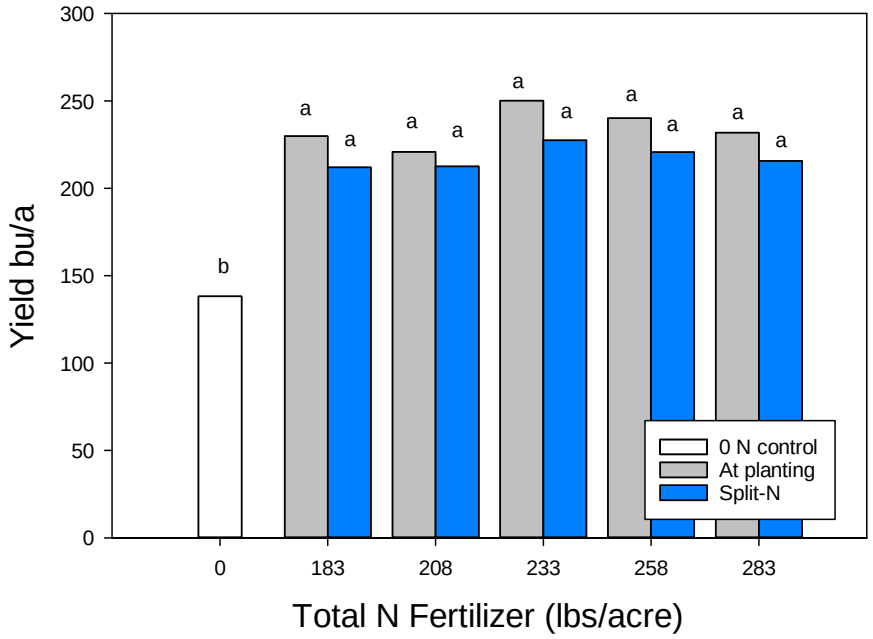


Location 2

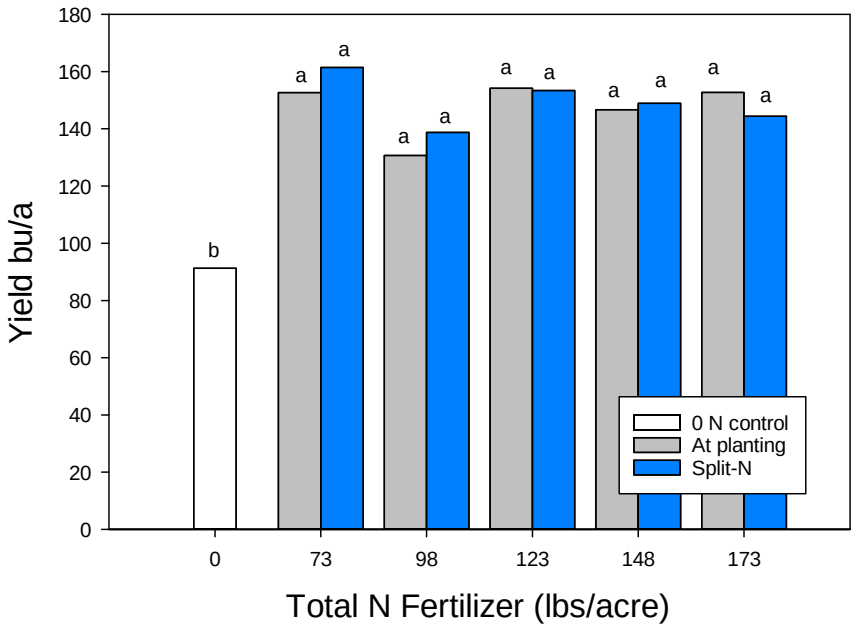


Yield response by location

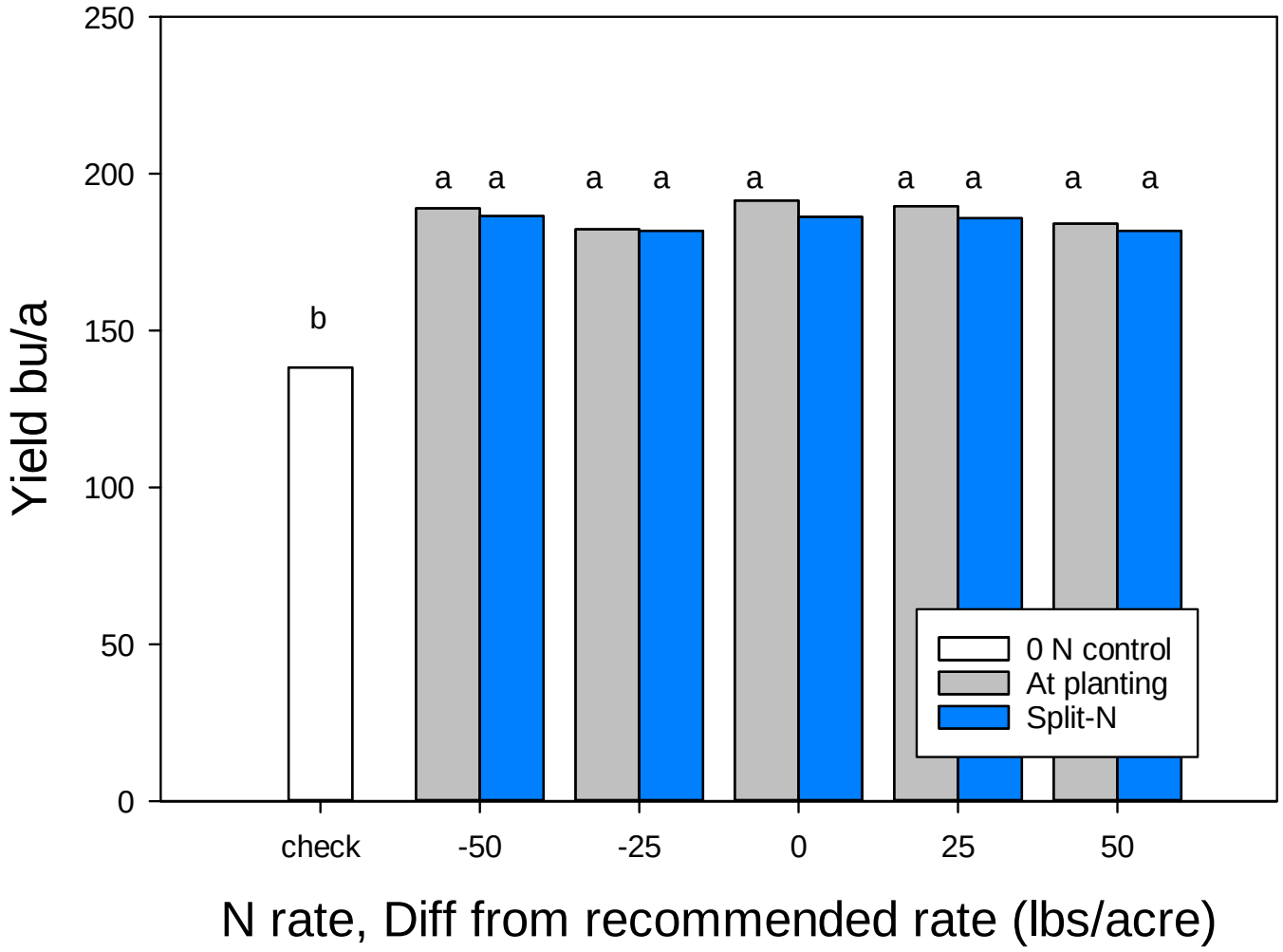
Location 3



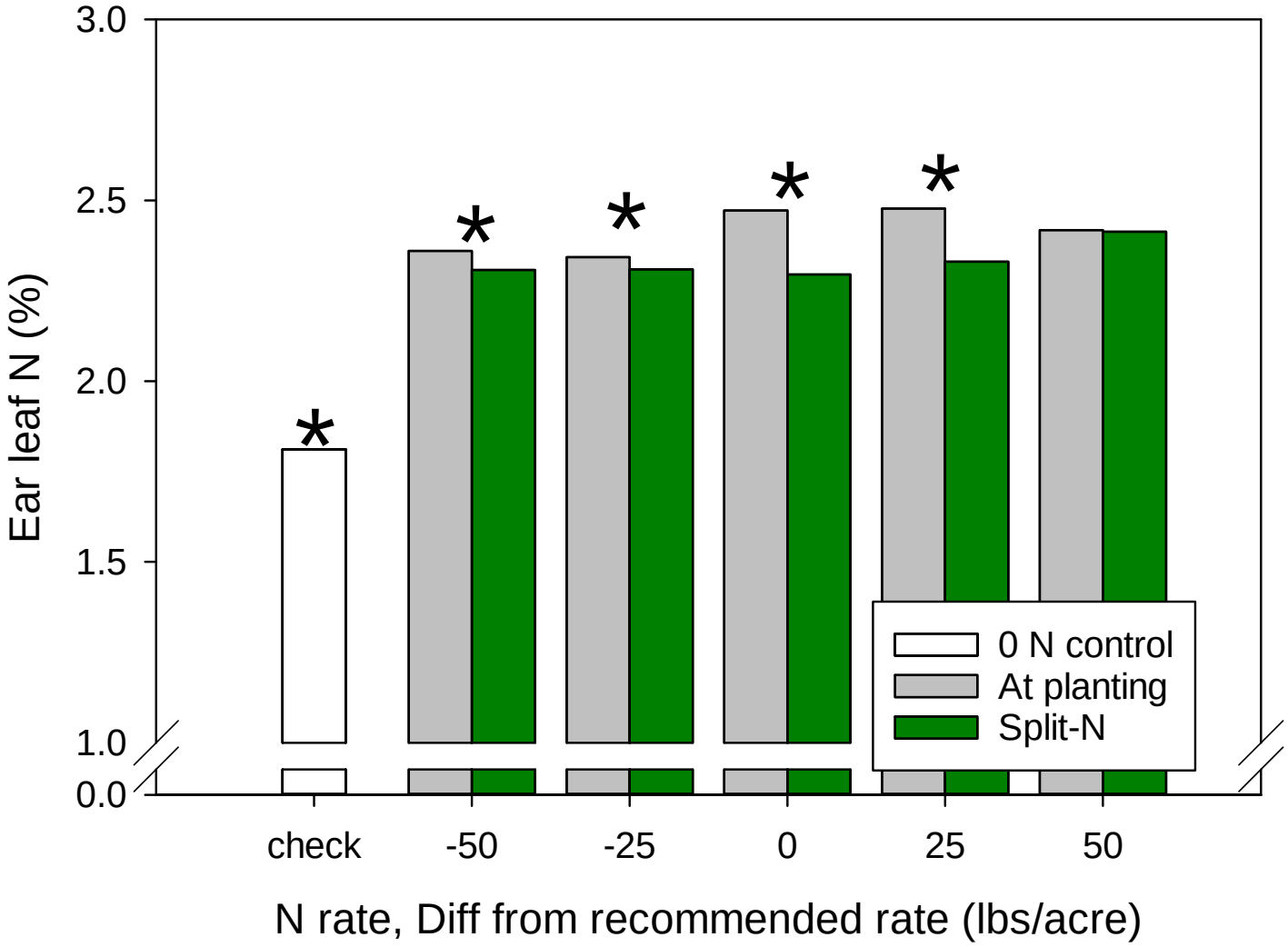
Location 4



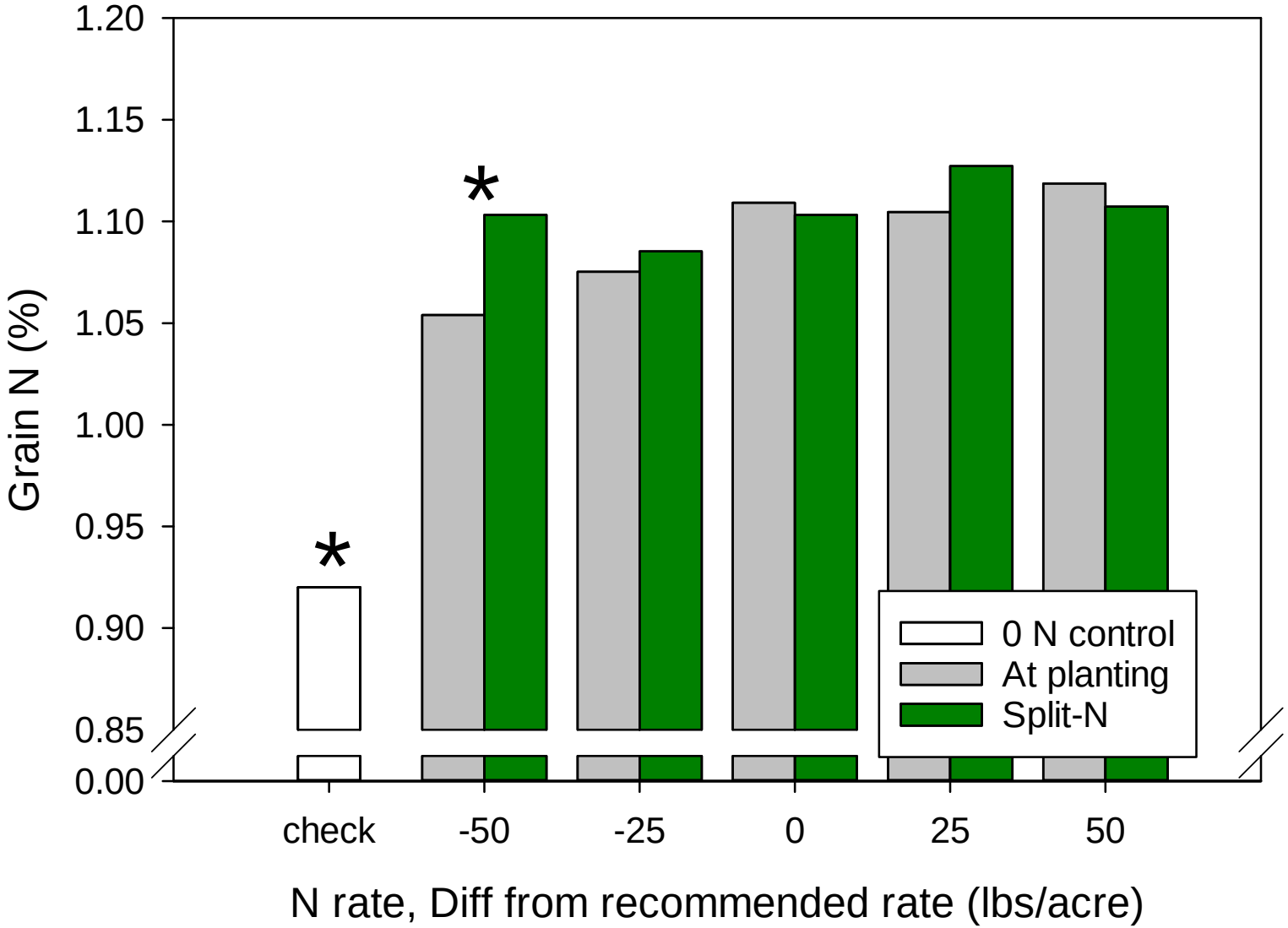
Yield across locations



Ear leaf N concentration



Grain N concentration



N use efficiency definitions

Production efficiency – based on harvested crop product (grain)

- Partial factor productivity (PFP): bu/a ÷ lb/a N fertilizer
- Agronomic efficiency (AE): Δ bu/a ÷ lb/a N fertilizer

Recovery efficiency – Based on nutrient recovery by the crop (uptake)

- Partial Nutrient Balance (PNB): lbs/a N in grain ÷ N fertilizer
- Apparent Recovery Efficiency (RE): Δ lb/a N uptake ÷ lb/a N fertilizer

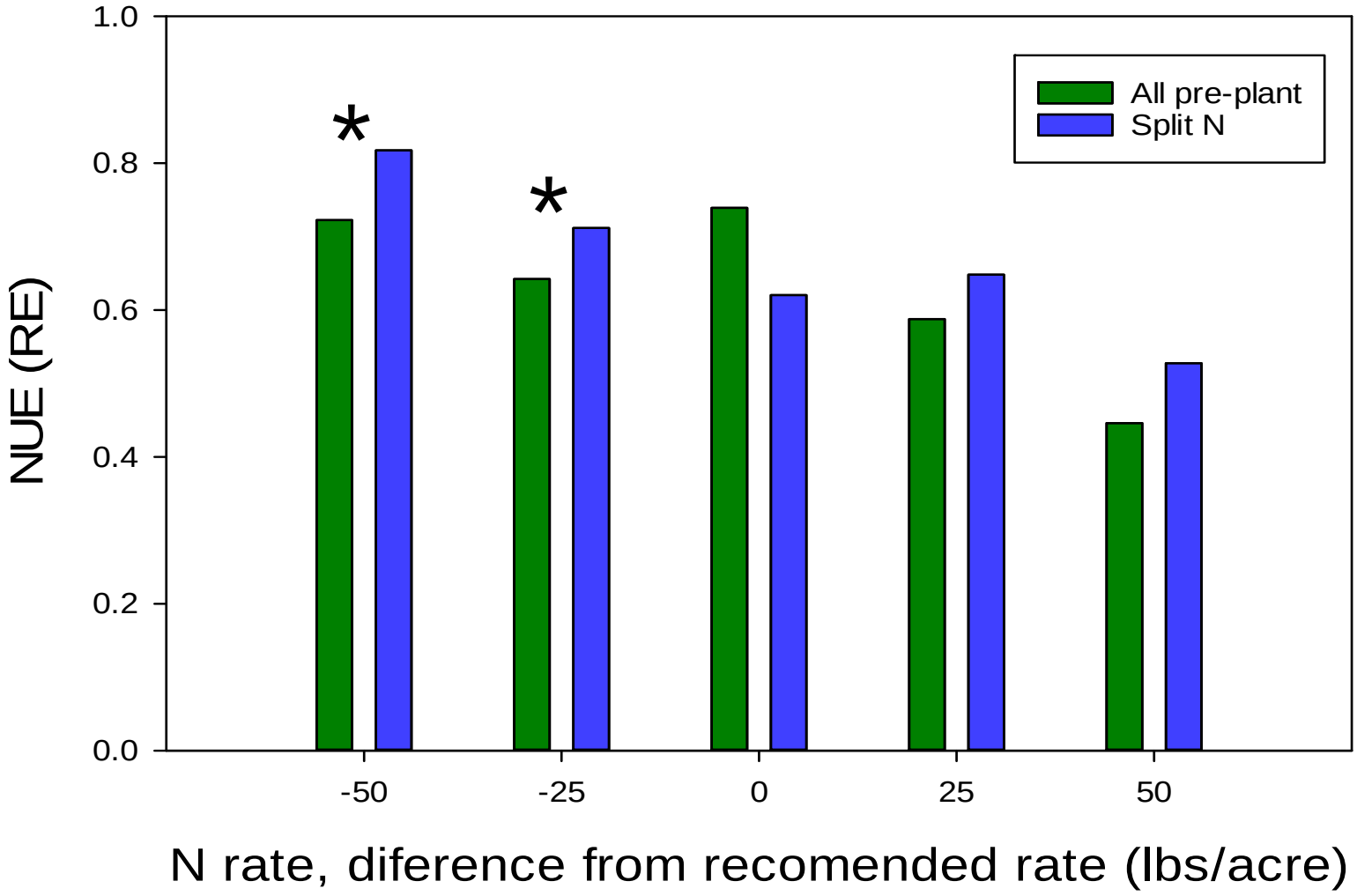
Apparent Recovery Efficiency

(lb increase in total N uptake per lb of N applied)

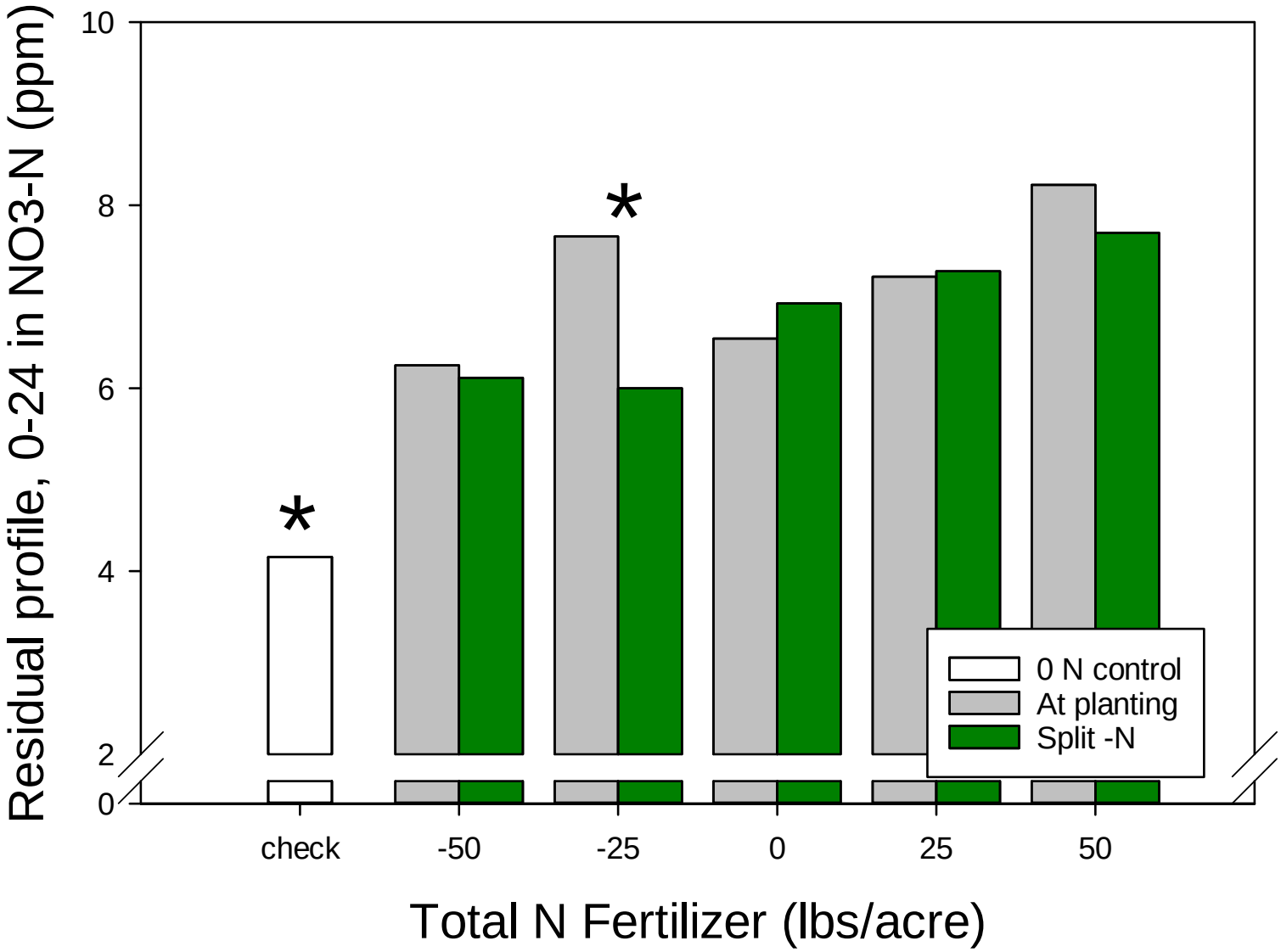
$$RE = (N_t - N_c) / N_r$$

- RE = Apparent Recovery Efficiency
- N_t = Nitrogen uptake
- N_c= Nitrogen uptake from 0 N control
- N_r = Nitrogen fertilizer rate

Apparent Recovery Efficiency across locations



End of season residual soil profile N



Summary

- Preliminary results showed soil-applied N post-flowering can provide N for corn uptake.
  - N movement to the root zone for uptake can be a limitation under dryland?
- Potentially more benefit as rescue N application, particularly from fall-applied N.

Summary

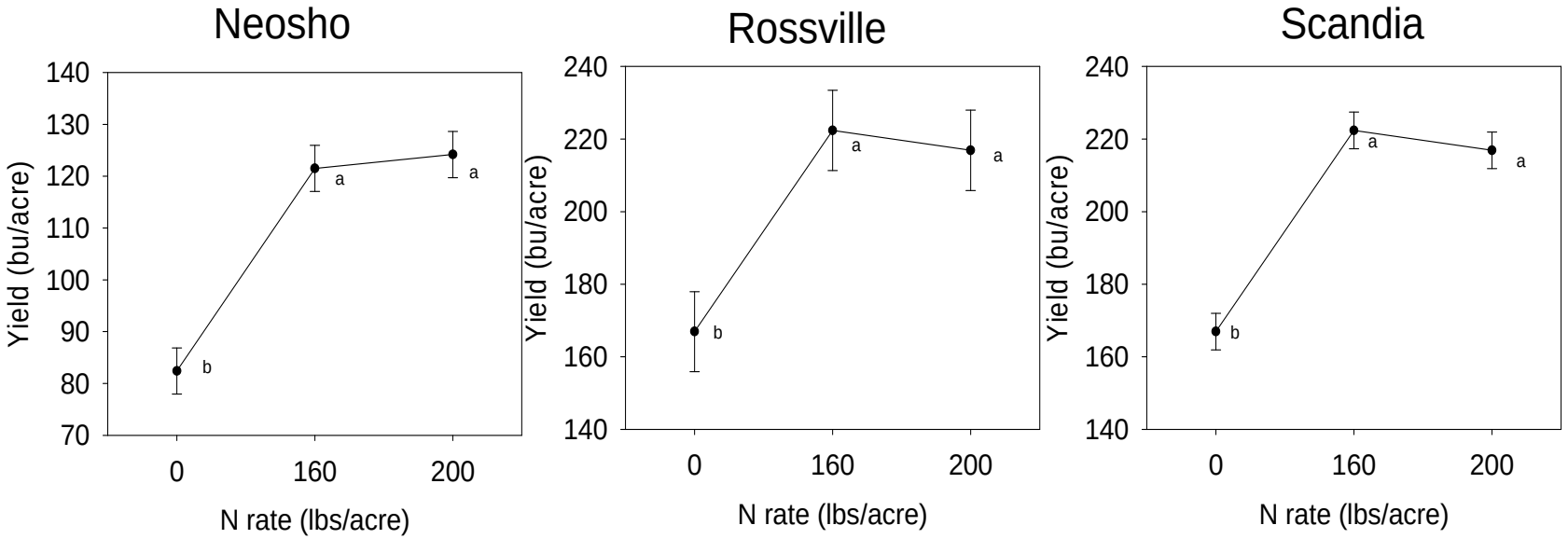
- Current N fertilizer recommendations may be high at high yielding sites.
- No yield penalty with late N applications
  - Possible yield advantage during years with early season N loses?
- Fertilizer recovery efficiency was higher with split late-N applications
  - Long term effect on NUE???

Late N Fungicide and Foliar N

Experimental Design

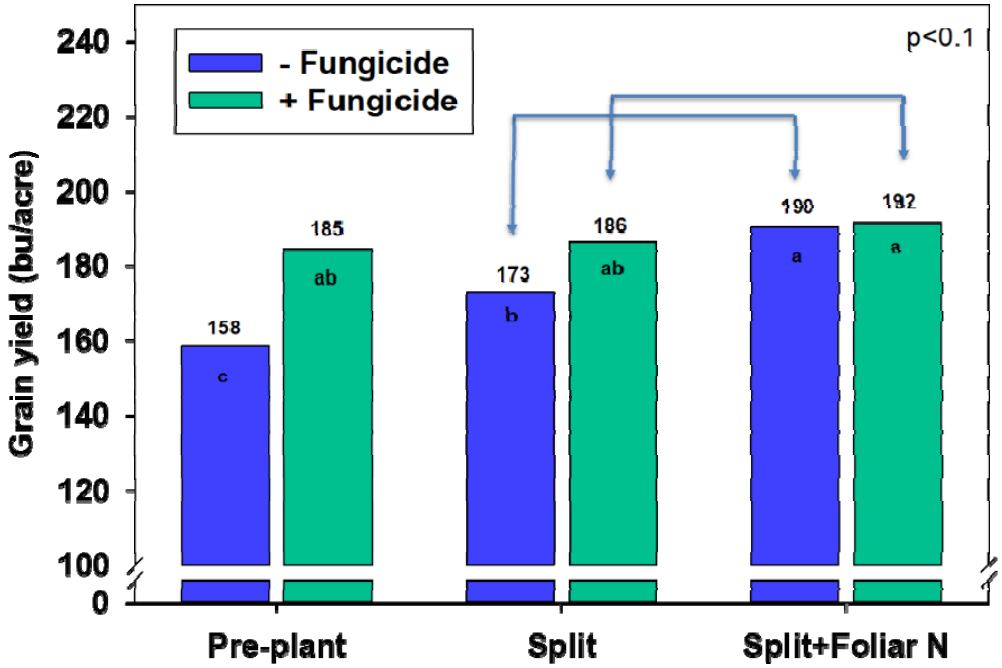
- Soil applied N 0, 160 and 200 lbs. N/acre
- Some treatments 120+40 and 160+40
- Fungicide applied to all N treatments
- Foliar N applied to some split treatments

Preplant N Rates and Yield



Corn grain yield response to N fertilizer application rates at planting at 3 locations in 2016. Different letters indicate statistically significant differences at the $p<0.1$.

Fungicide Split N and Yield



Corn grain yield response to foliar N fertilizer and fungicide application with the 200 lbs. N/a rate across 3 locations in 2016. Different letters indicate statistically significant differences at the p<0.1.

Summary

- Corn yield responded to N fertilizer at all locations
- There was no yield difference between 160 and 200 lbs. N/acre rates
- Fungicide increased yields at the 200 lbs. N/acre rate
- Grain N concentration increased significantly with 4.5 lbs./acre additional foliar N

Questions?

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