



Increasing Root Mass and Yield in Corn Through the Use of Fertilizer Additives

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What Does it Take to Produce Maximum Yield - 2009

COPY YIELD HERE 399.76

2008 North Carolina Corn Yield Contest Official Entry

Deadline November ~~30~~, 2009

ENTRANT: H & H Farms

DIVISION: (circle) Irrigated
Non-irrigated

ADDRESS: 6937 Willow Green Rd.

Snow Hill, N.C. 28580

AREA: (circle) 1 2 3 4 5 6

COUNTY: Greene

TILLAGE: (circle) Conventional Till
No-Till

SUMMARY OF PRODUCTION PRACTICES

HYBRID: 31P 42 POPULATION: 51,00 ROW WIDTH: 20"

STARTER FERTILIZER: TYPE: (circle) Dry, Liquid, None

AMOUNT: (lbs/A) N 5 P 30 K 5 Other in furrow

APPLICATION METHOD: (circle) Broadcast, 2x2 Band, Surface Band, Inject

MAIN FERTILIZER APPLICATION: TYPE: (circle) Dry Liquid Anhydrous None

AMOUNT: (lbs/A) N 225 P 95 Other

APPLICATION METHOD: (circle) Broadcast, Surface Band, Injected

APPLICATION TIMING: (circle) Preplant, Layby, Other 1/2 at planting 1/2 Layby



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Maximizing Yield

The Good – The Bad – The Ugly

The Good – Better Hybrids allow for Increasing Light Use

- Higher Plant Populations
- Row Width and Plant Spacing



The Bad – Crop Stress

- Avoid Stress at the Critical Time
- Prepare the Crop for Stress
- Root – Shoot – Grain



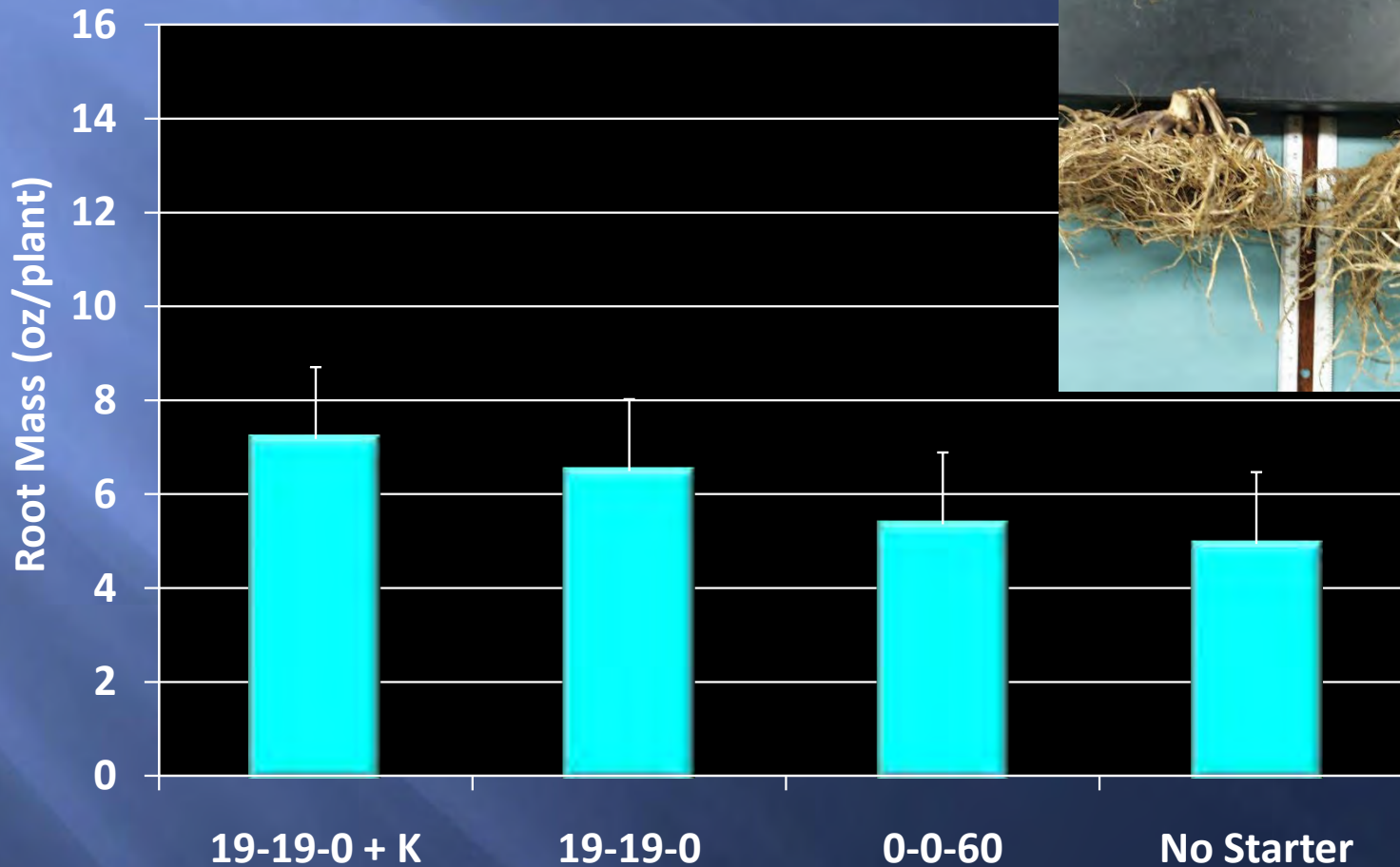
The Ugly

- Controlling Nutrient Costs and Loss



Differences in Root Ball Mass

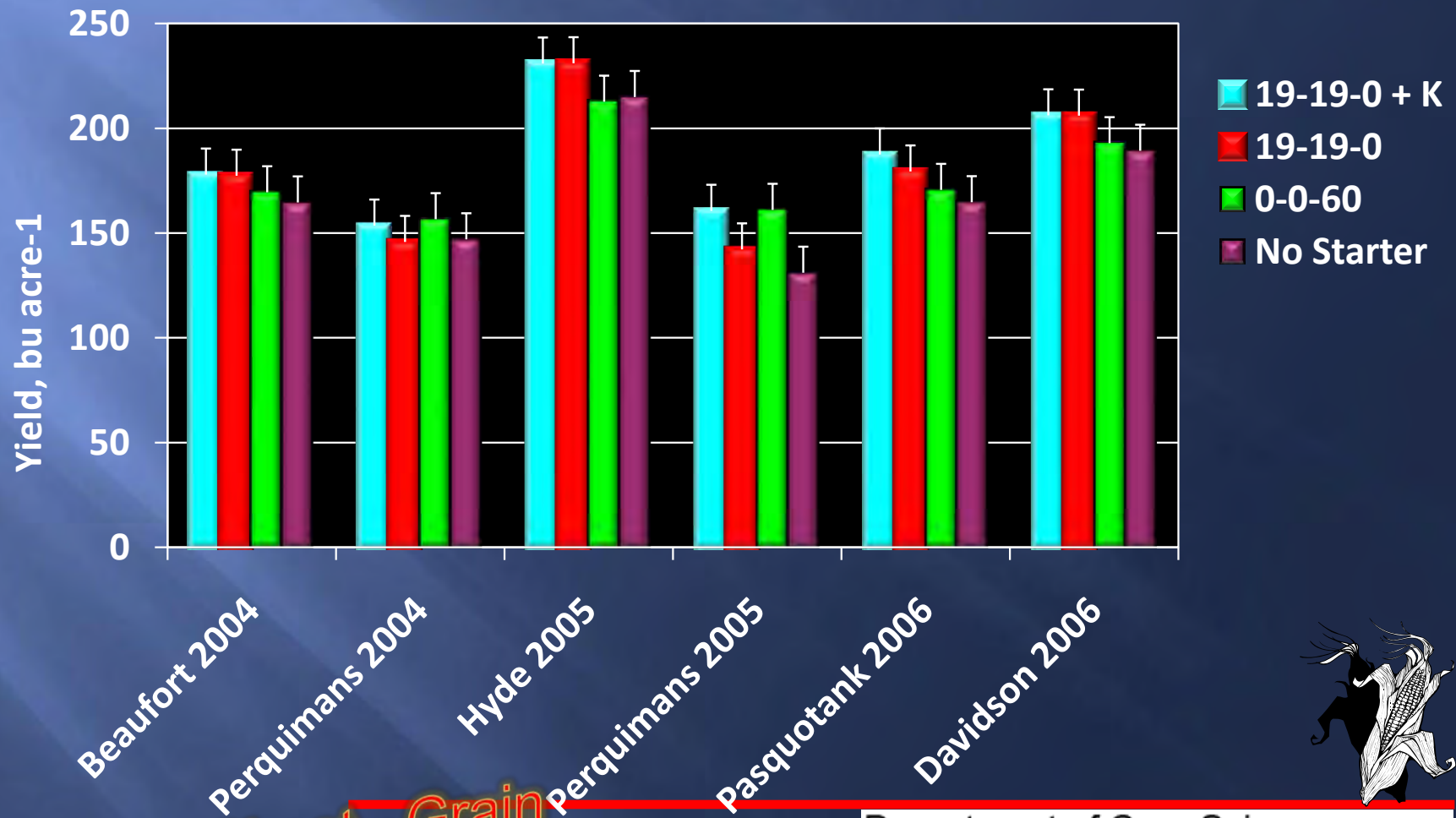
Fertility Treatments across Plant Populations:
2004-05



Root - Shoot - Grain

Effect of Starter Treatments on Corn Yield

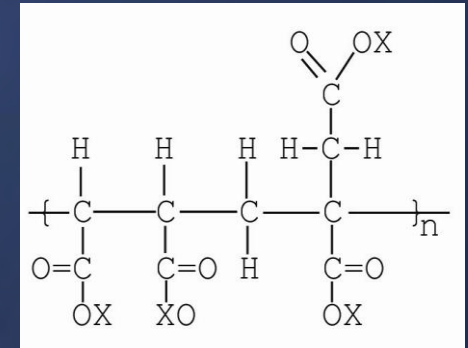
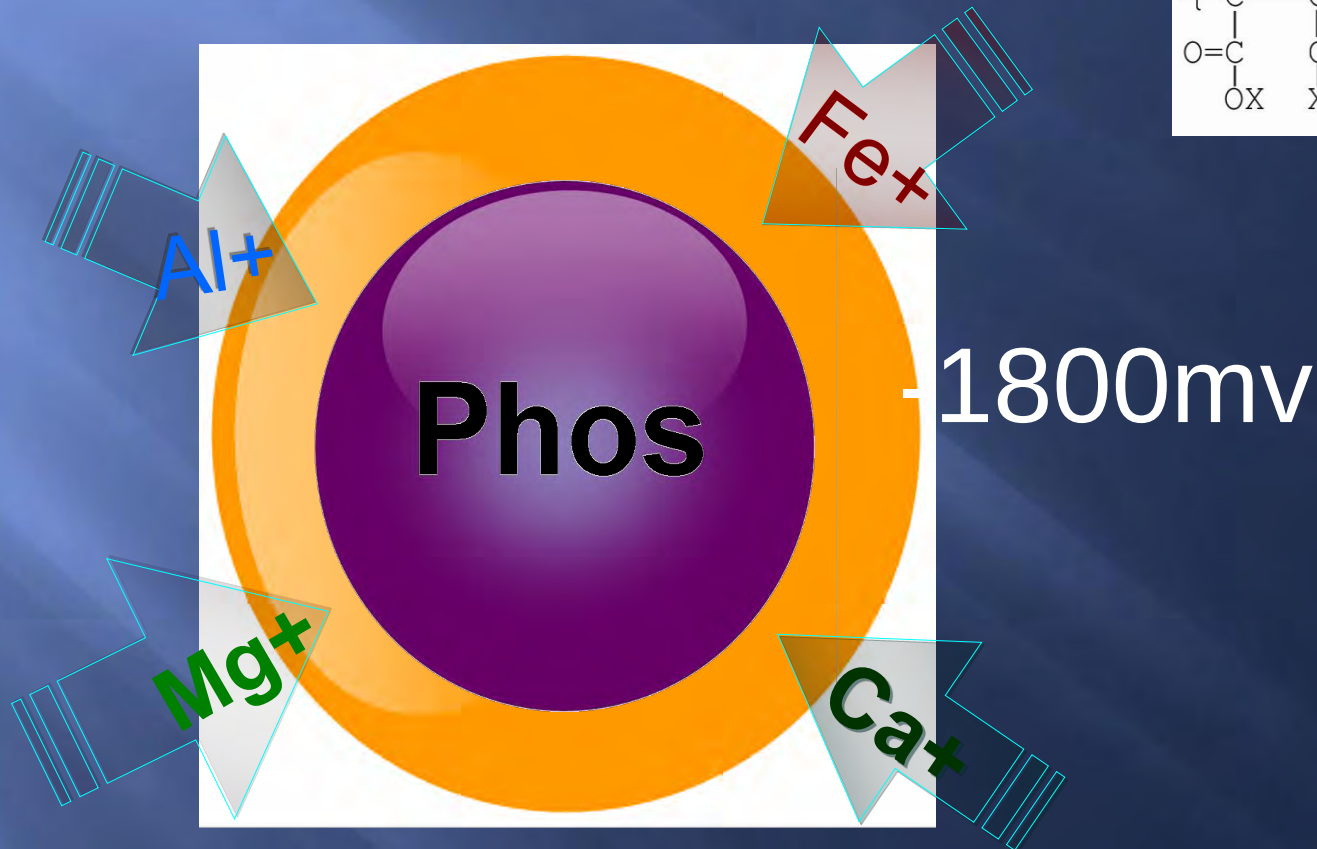
Fertility Treatments across Six NC Sites



Root - Shoot - Grain



Avail – Polymer Coating

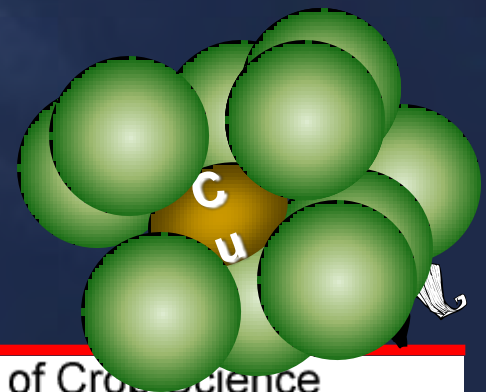
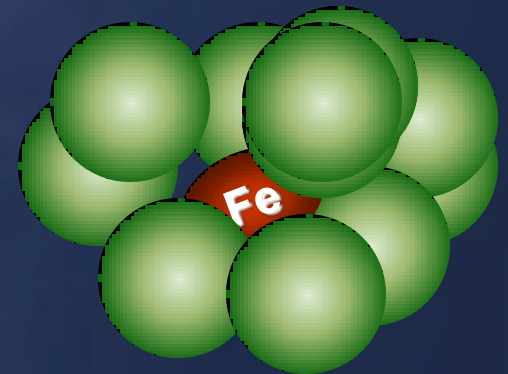
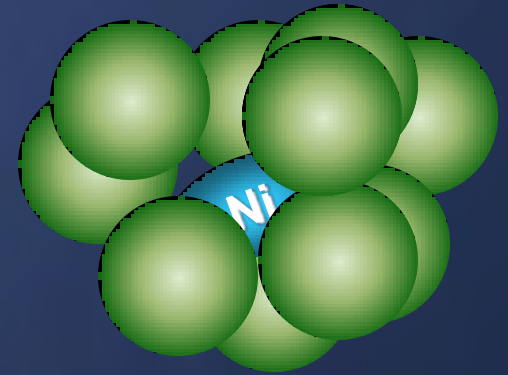


Inhibiting Cations that cause “P” Fixation



Nutrisphere – Polymer Coating

- ▣ A polymer with high CEC
- ▣ Grabs hold of multi-valent cations (like Ni^{5+})
- ▣ If the nickel ions are sequestered they are unavailable for urease!
- ▣ NUTRISPHERE – N also ties up iron (Fe) and copper (Cu)
- ▣ Cu and Fe are needed for conversion of ammonia to nitrate on the other side of the N-cycle



Do Fertilizer Additives Such as Avail or Nutrisphere Increase Root Growth and/or Yield?



12 – 12 – 4 @ 20 gal/acre



12 – 12 – 4 @ 20 gal/acre
Plus Avail



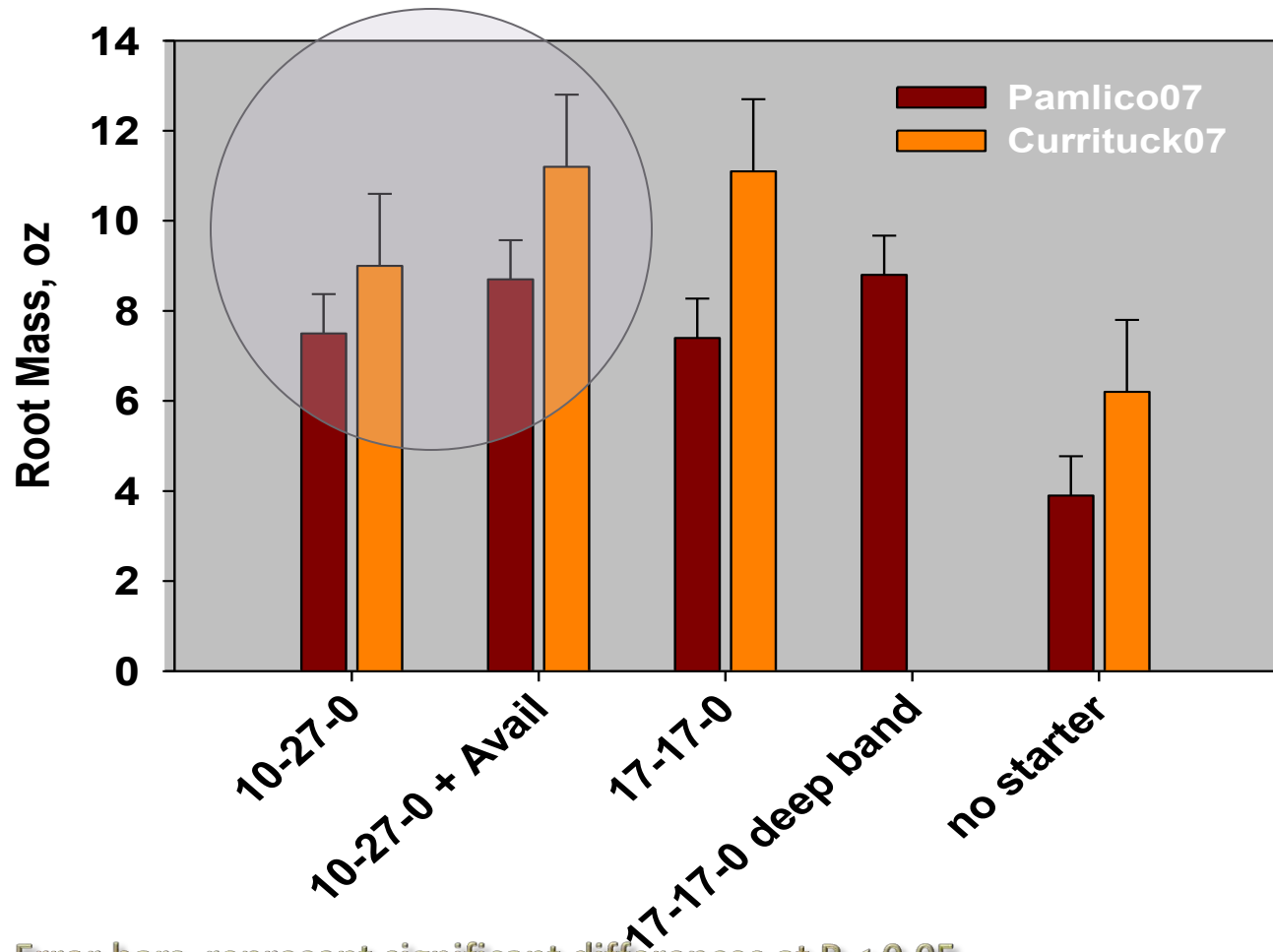
Root – Shoot – Grain

Studies With Avail Alone – 2007 to 2009

- ☑ Sites:

Perquimens 2007	Roanoke sandy loam	Terral TV21BR40
Pamlico 2007	Wasda Muck	DeKalb DKC69-71
Currituck 2007	Pasquotank silt loam	Pioneer 31G98
Alamance 2007	Dragston sandy loam	Pioneer 31G98
Davidson 2007	Kirksey clay loam	Pioneer 31G98
Pasquotank 2008	Bladen silt loam	Pioneer 33M53/57
Beaufort 2008	Cape Fear silt loam	Pioneer 33M53/57
Hyde 2009	Ponzer muck	Pioneer 33M57
Beaufort 2009	Roanoke sandy loam	Pioneer 31P42
- ☑ Design: Split plot in four Blocks
2007 Main Plots: Starter Blends – 10-27-0; 10-27-0 + Avail; 17-17-0; 12-12-4
Subplots: Application Rate – 5, 10, 20, 40 gals of solution per acre
2008 Main Plots: Hybrids – Bt and nonBt isoline
Subplots: Starter Blends –
10-27-0; 10-27-0 + Avail; 17-17-0; 12-12-4; 30-0-0; 0-0-27, check
- ☑ Measurements:
rooting depth, root mass, plant height, stalk diameter, grain yield
- ☑ Analysis: Proc Mixed with mean separations using Fischer's LSD

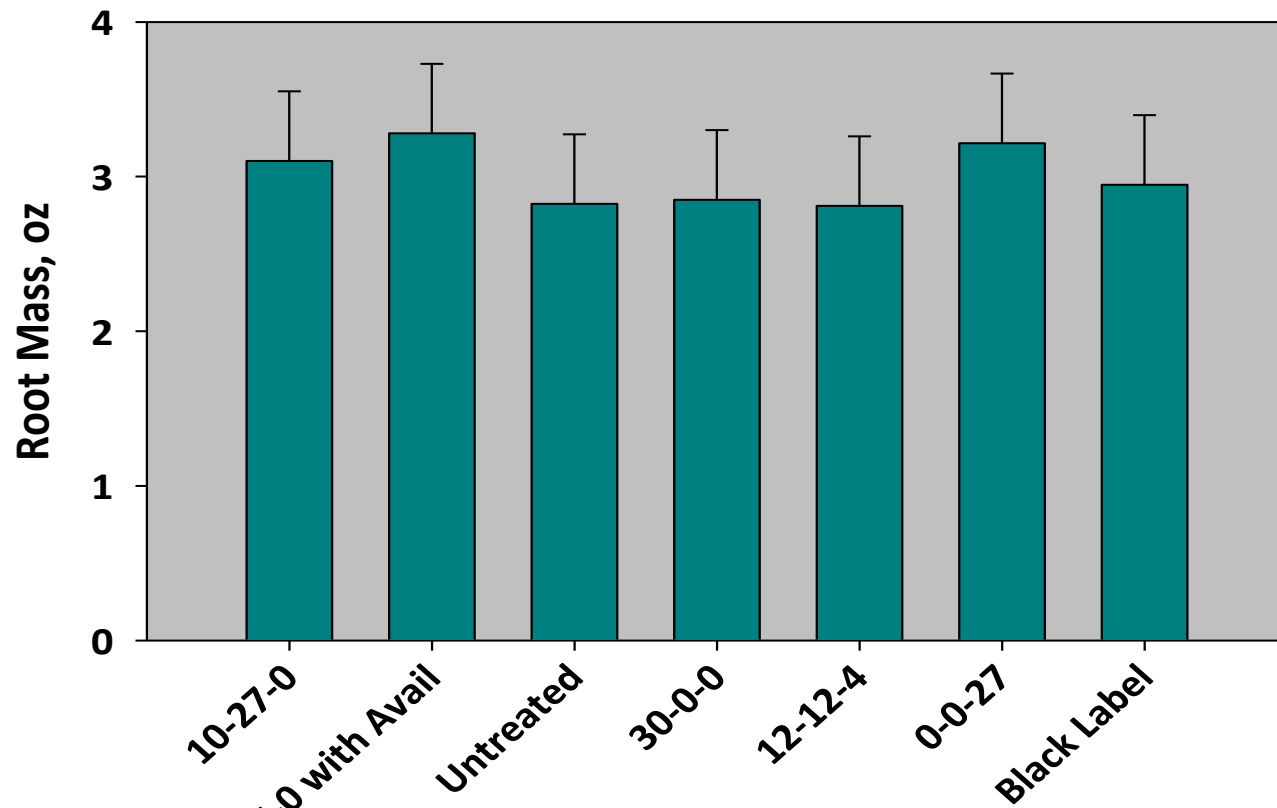
Differences in Root Mass - 2007



Error bars represent significant differences at $P < 0.05$



Impact of Fertilizer Additives on Root Mass – Hyde 09



Error bars represent significant differences at $P < 0.05$



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Comparison of Root and Stalk Properties with (Yes) and without (No) Avail added to the starter

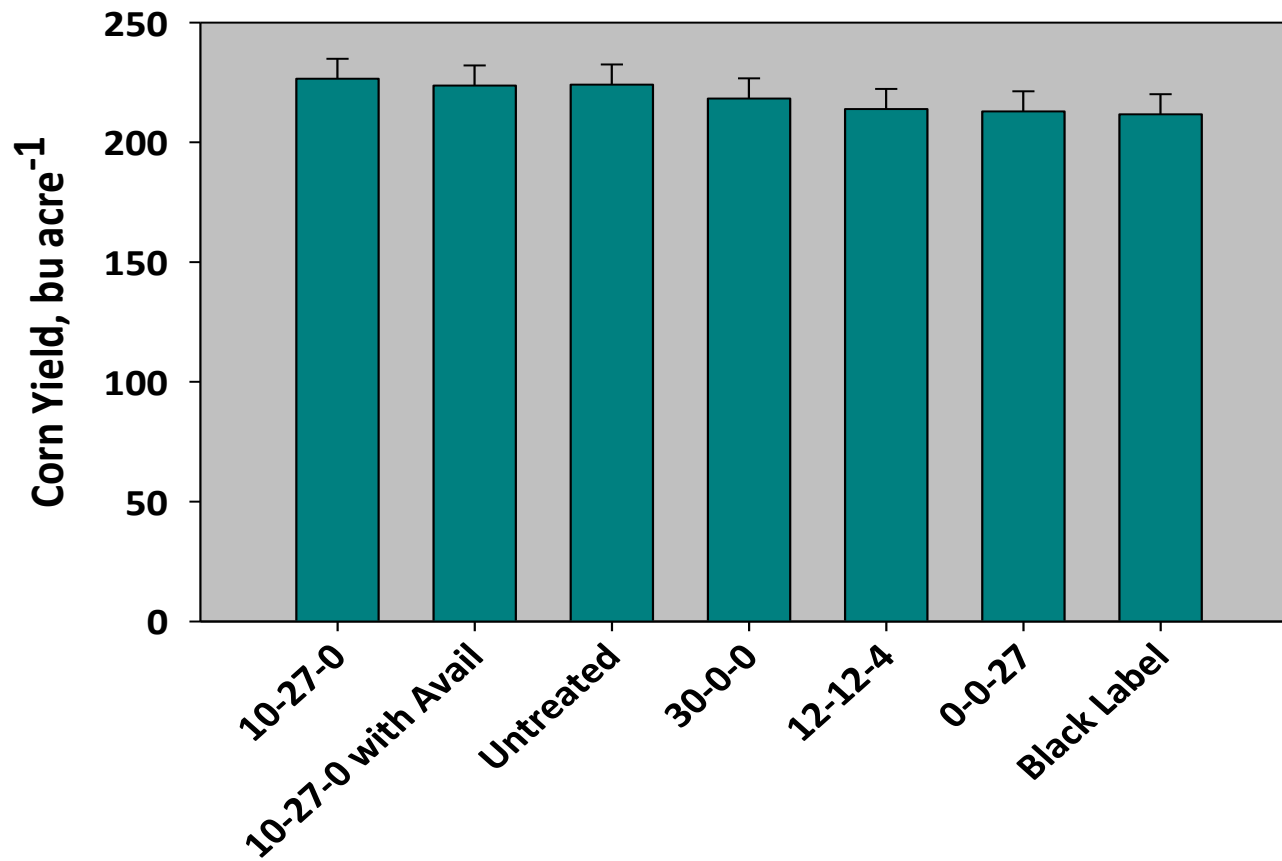
Location - Year	Root Properties						Stalk Properties	
	Depth (in)		Width (in)		Mass (oz)		Ear Internode Diameter (in)	
	No	Yes	No	Yes	No	Yes	No	Yes
Pamlico -07	5.3	6.0	5.8	6.1	7.5	8.7	0.95	1.0
Currituck - 07	3.6	3.7	5.0	5.0	9.0	11.2	0.93	0.95
Beaufort - 08	2.6	2.6	4.0	4.3	2.4	2.7	0.74	0.78
Pasq. - 08	3.7	3.8	5.8	5.6	4.7	3.8	0.79	0.83
Hyde - 09	6.9	7.1	5.2	5.4	3.1	3.2	0.95	0.96



10 gal/acre of 10-27-0 with Avail

No Starter

Impact of Fertilizer Additives on Yield – Hyde 09

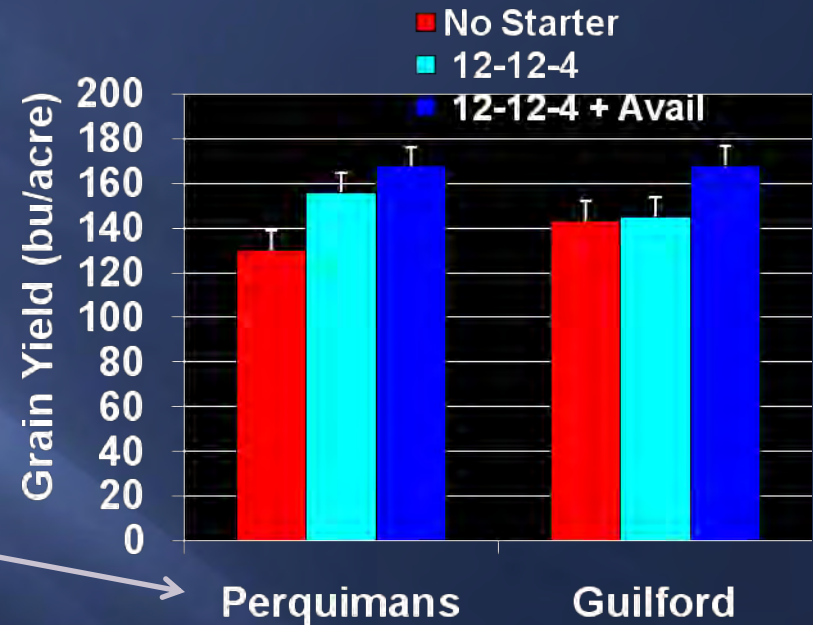


Error bars represent significant differences at $P < 0.05$



Corn Yield Response to Starter and Starter with Avail

Location - Year	P Level	Corn Yield (bu acre ⁻¹)		
		No Starter	Starter only	Starter with Avail
Pamilico -07	Med	185.1	191.0	200.7
Currituck - 07	Med	190.8	198.6	199.4
Beaufort - 08	High	128.0	122.7	127.5
Pasq. - 08	High	165.3	153.7	160.0
Perq. - 07	Low	131.3	155.0	167.8
Guilford - 07	High	143.3	142.2	160.9
Davidson - 07	High	123.7	151.0	133.5
Beaufort - 09	High	173.8	174.9	177.4
Hyde - 09	High	224.1	226.5	223.7



Use of Avail increased yield by an average of 3.94 bu acre⁻¹

Studies With Nutrisphere Alone – 2007 to 2009

- ☑ **Sites:**

Pamlico 2007	Wasda Muck	DeKalb DKC69-71
Currituck 2007	Pasquotank silt loam	Pioneer 31G98
Pamlico 2008	Yonges L. fine sand	Pioneer 31G96
Bertie 2008	Goldsboro sandy loam	DeKalb DKC69-71
Pamlico 2009	Yonges L. fine sand	Pioneer 31P44
Beaufort 2009	Roanoke sandy loam	Pioneer 31P42

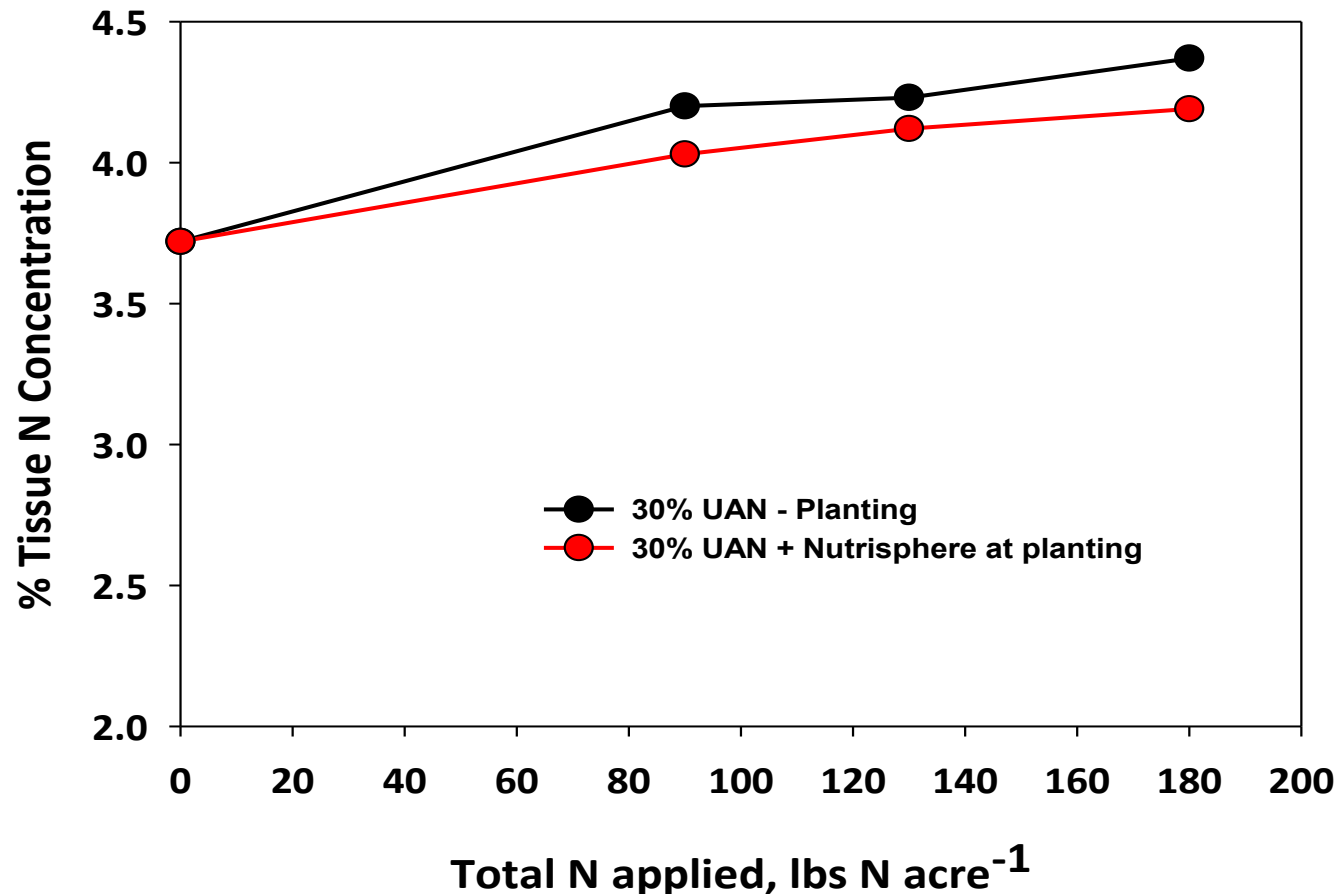
- ☑ **Design: Split plot in four Blocks**
 - 2007 and 208 Main Plots: 30% UAN or 30% UAN with Nutrisphere at planting
 - Subplots: Application Rate – 0, 10, 20, 40, 80 gals per acre
 - 2009 Main Plots: Hybrids – 30% UAN or 30% UAN with Nutrisphere
 - 2009 Subplots: At Planting or Sidedress
 - Sub-Subplots: 0, 16.7, 50.2, 66.9, 83.7 gals per acre

- ☑ **Measurements:**
 - Grain yield, tissue concentration at V5 and R1, biomass at R1, total N at R1

- ☑ **Analysis: Proc Mixed with mean separations using contrast statements**

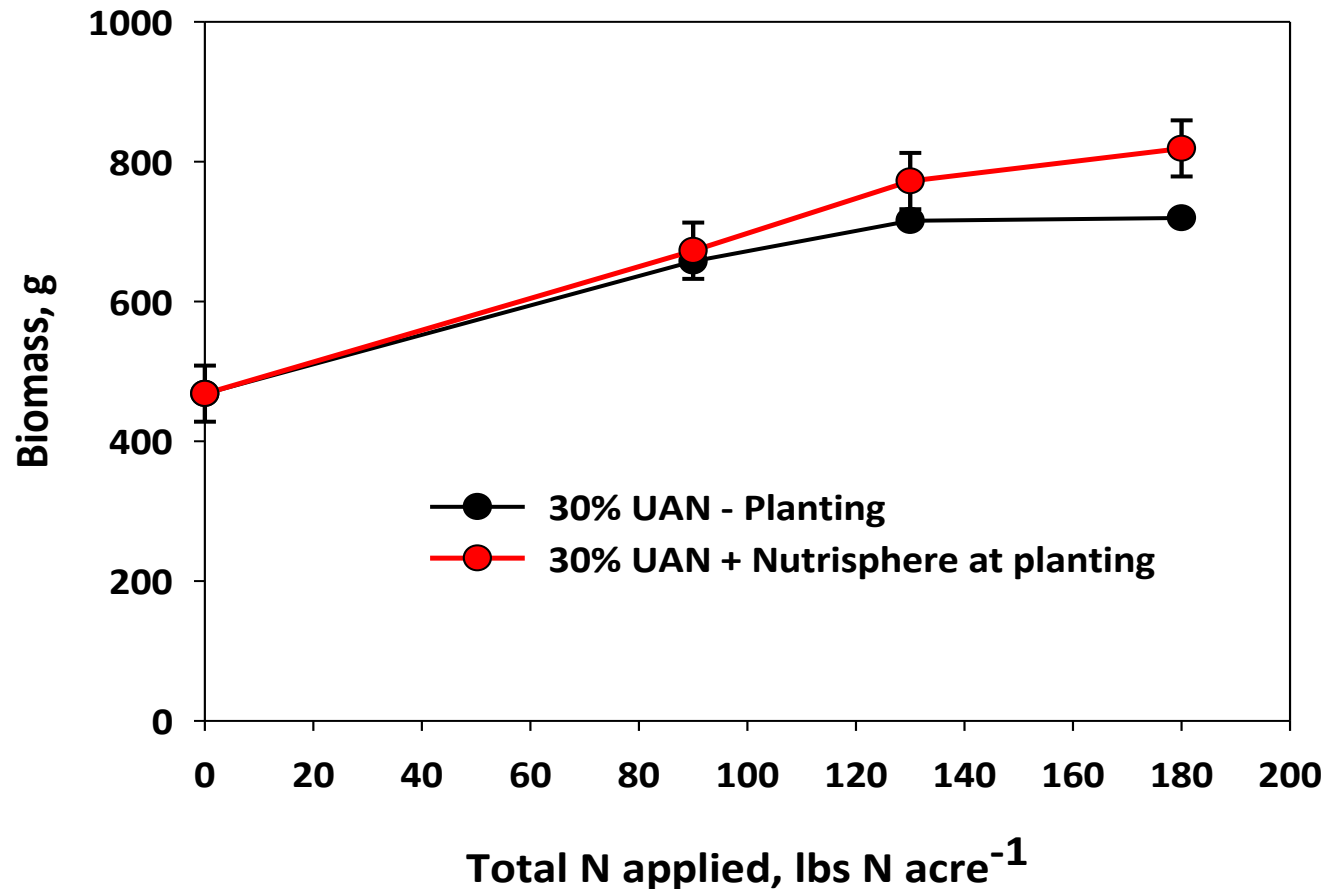
Pamlico County - 2009

Tissue N Concentration at V5



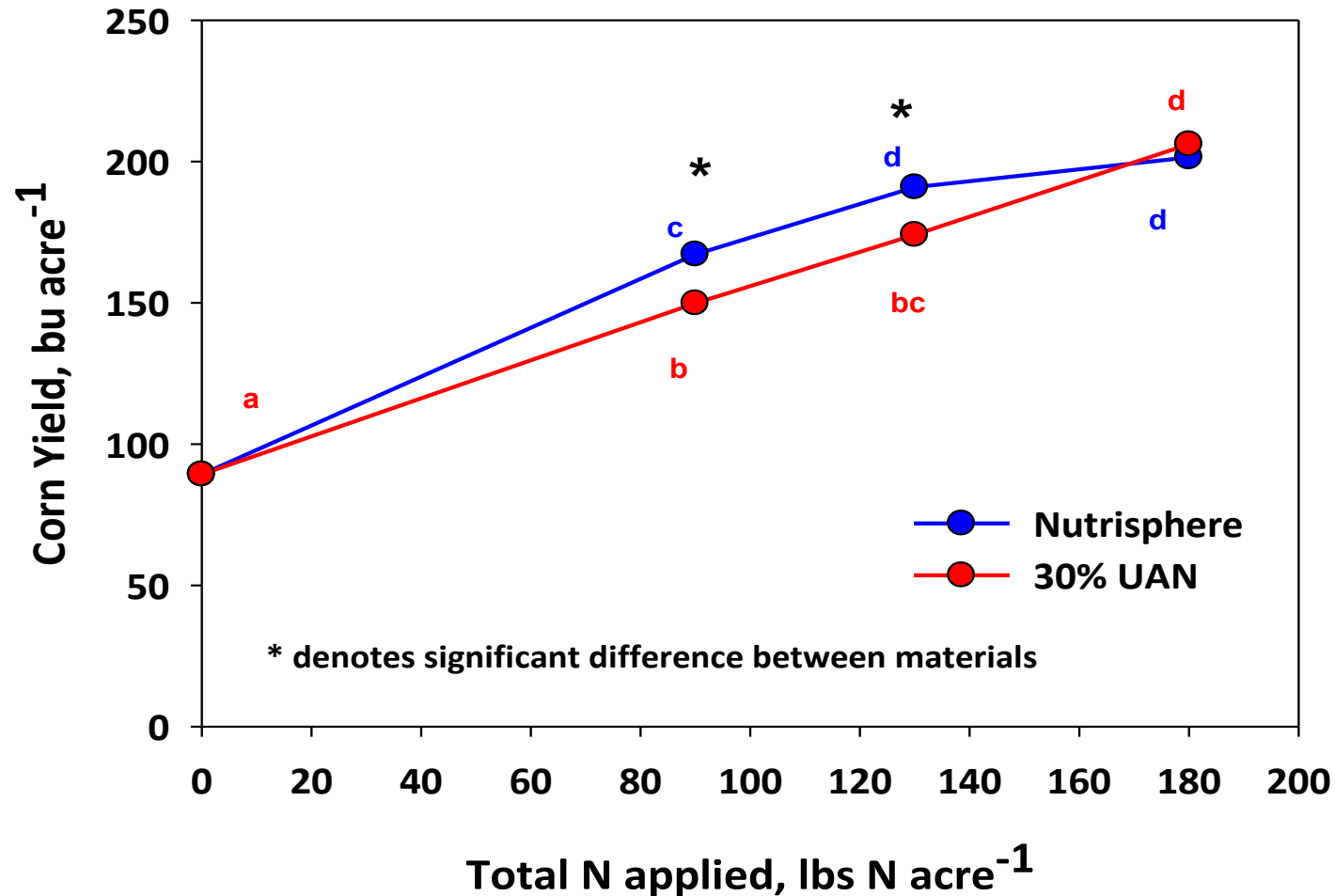
Pamlico County - 2009

Biomass Response to N Source and Rate



Pamlico County - 2009

Yield Response to N Source and Rate



Effects of Nutrisphere on Yield and Optimum N Rate

Corn Yield (bu acre ⁻¹)				
	30% UAN		UAN + Nutrisphere	
Location - Year	Maximum Yield	Economic Optimum N rate	Maximum Yield	Economic Optimum N Rate
Pamlico -07	209.7	187	219.1	135
Currituck – 07	176.5	147	191.1	109
Pamlico – 08	165.9	230	169.8	180
Bertie - 08	64.6	0	87.8	0
Pamlico-09	206.1	294	204.6	281
Beaufort -09	214.0	234	224.5	196
Pamlico-09 (sidedress)	203.4	247	207.9	262
Beaufort-09 sidedress	223.6	202	233.0	234

Studies Combining Avail and Nutrisphere

- ☑ Sites: Forsythe 08 Cecil silt loam DeKalb DKC61-69
 Guilford 08 Dragston sandy loam DeKalb DKC61-69
 Davidson 08 Kirksey clay loam Syngenta NK68-B8

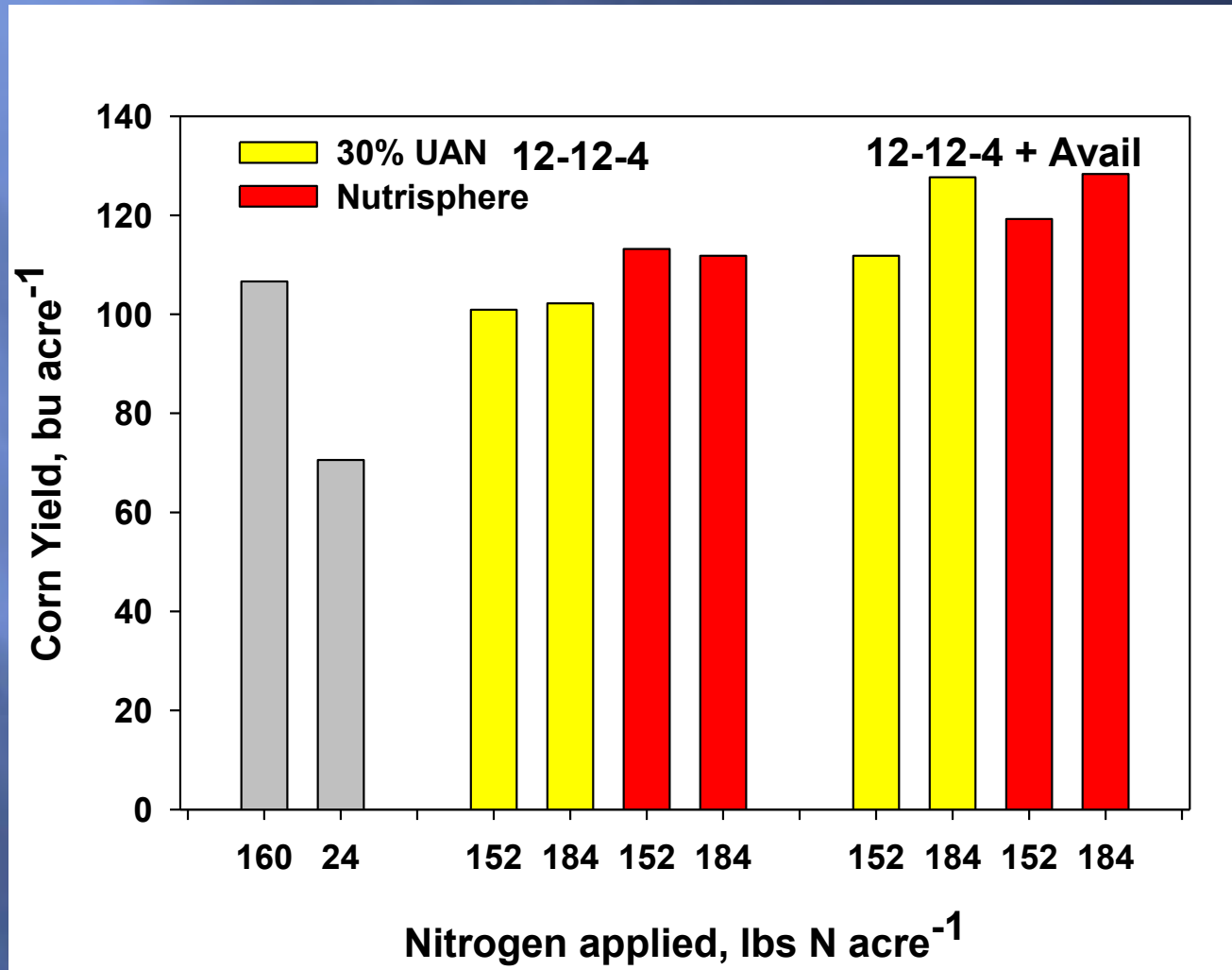
- ☑ Design: Split plot in four Blocks
 Main Plots: Starter treatments – 12-12-4, 12-12-4 with Avail, check
 Subplots: UAN, UAN + Nutrisphere , check
 two rates - 152 or 184 lbs of N acre⁻¹

- ☑ Measurements:
 grain yield

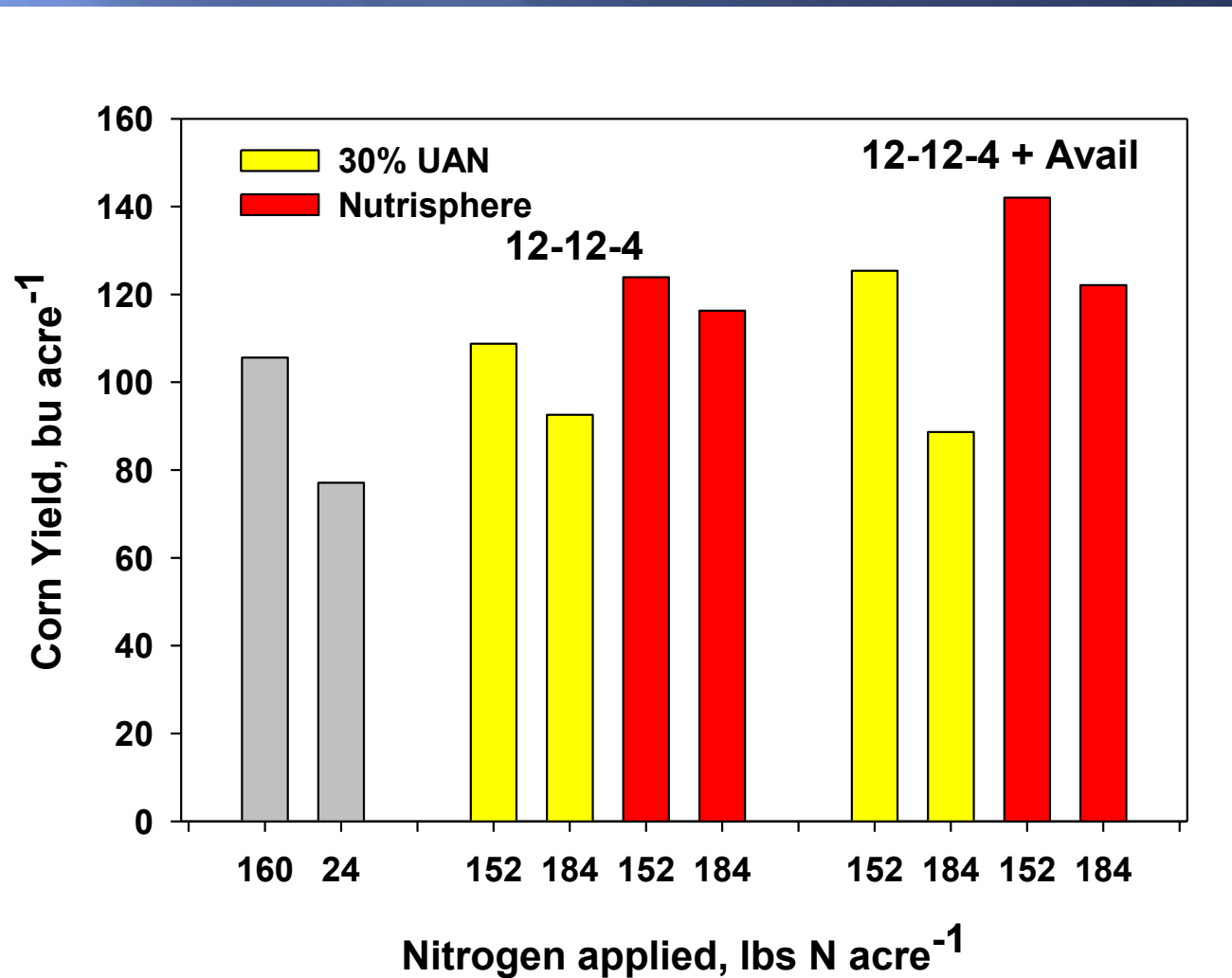
- ☑ Analysis: Proc Mixed - separations made using contrast statements



Differences in Yield Guilford Co. 2008



$p = 0.0192$ - 12.12.4 vs 12.12.4 + Avail

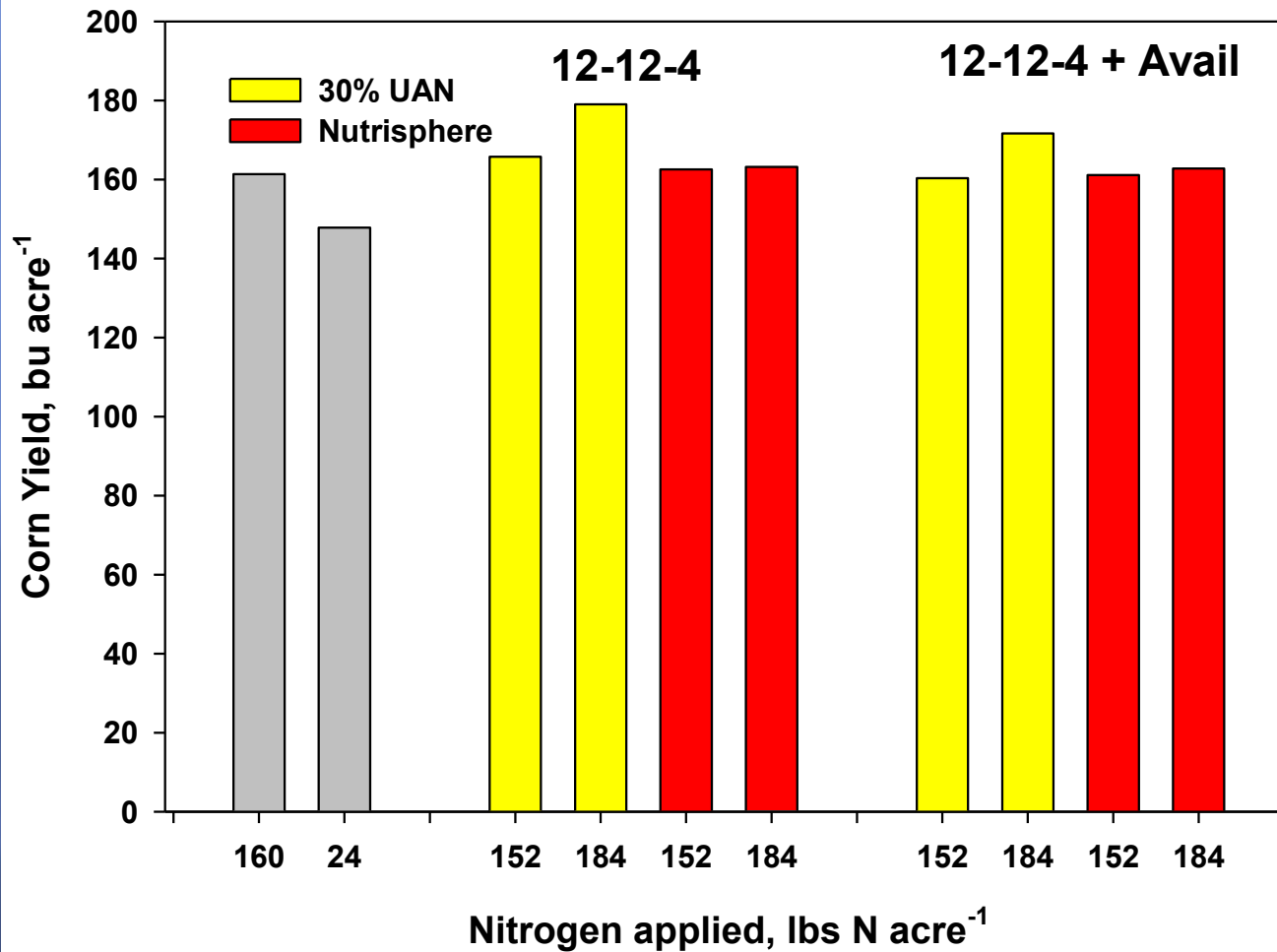


(pH = 6.1)



$p = 0.0394$ – UAN vs Nutrisphere when starter is applied

$p = 0.0398$ – UAN vs Nutrisphere + Avail



Conclusions



- Avail and Nutrisphere can enhance root and plant growth. This effect is probably the result of enhanced root uptake of N and P.
- Avail alone only increased yield when soil test levels of P were low to medium or when pH was a limiting factor
- When used at planting Nutrisphere reduced crop N requirement by enhancing early growth
- When used together these products are more likely to produce a yield response.



Kelvin Brower Farm Doon Iowa trials 6 rows of 30" corn interseeded with 12 rows of 15" beans.
Trials for increasing yields with Cropping Systems and using Avail +NutriSphere-N.
Untreated check with 10-34-0 starter + 32% UAN= 336 bu. /acre
Added Avail in 10-34-0 = 348 bu. /acre
Added NutriSphere-N in UAN no Avail =351 bu./acre
Stacked Avail in 10-34-0 + NutiSphere-N in UAN = 362 bu./ acre
Soybeans in this system averaged 90 bu./acre





Questions

