



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

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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



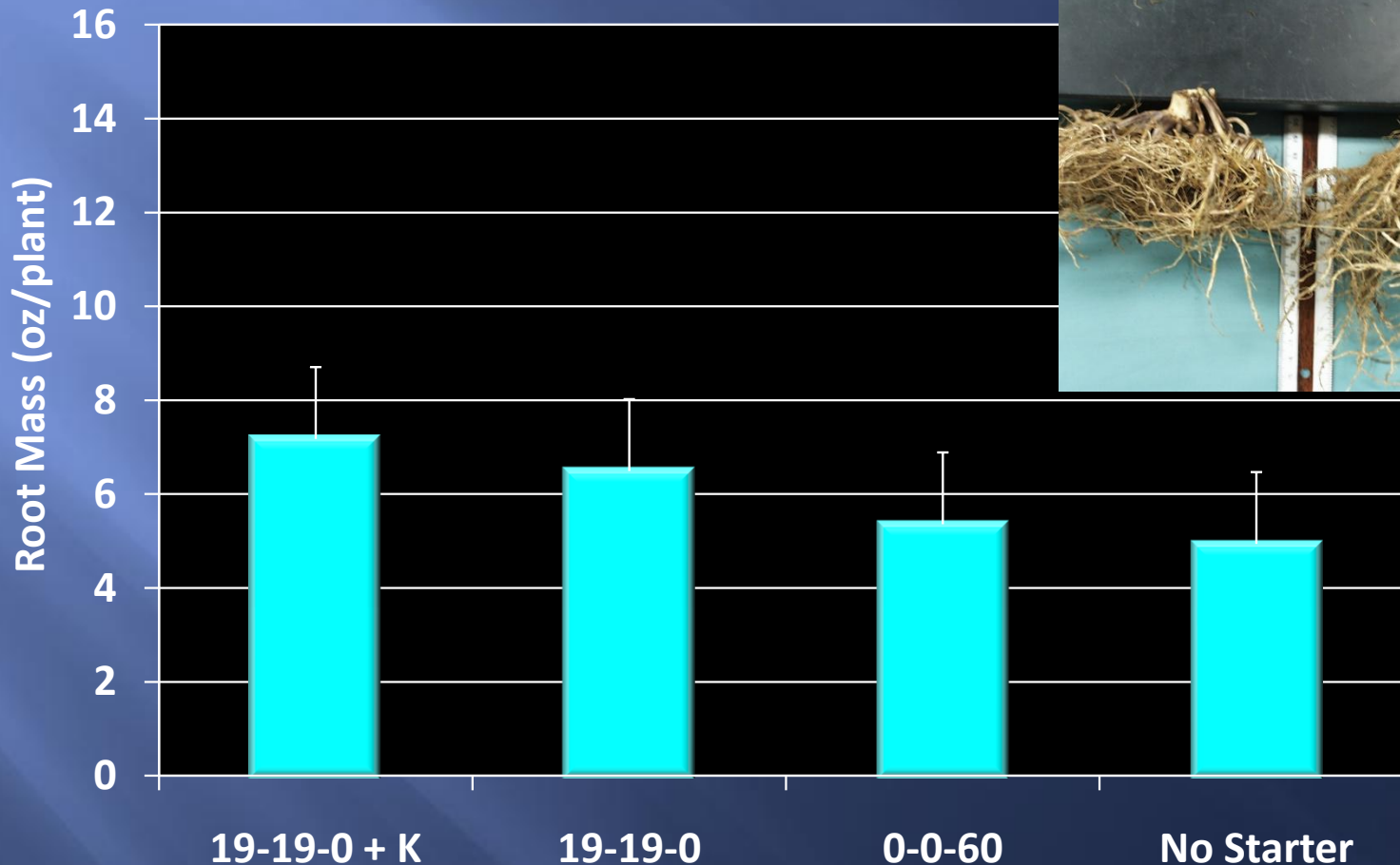
The Ugly

- Controlling Nutrient Costs and Loss

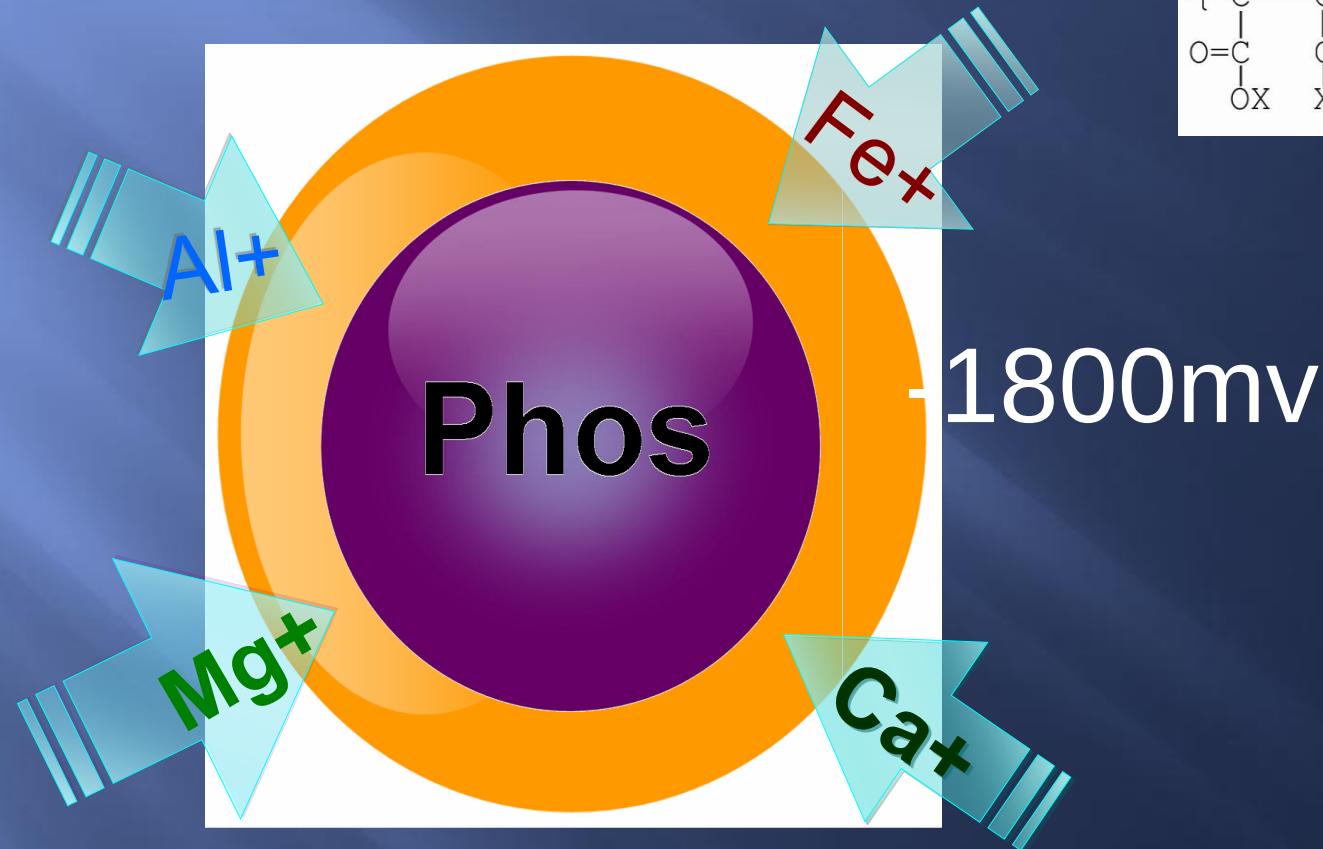


Differences in Root Ball Mass

Fertility Treatments across Plant Populations:
2004-05



Root - Shoot - Grain



Studies With Avail Alone – 2007 to 2009

☑ Sites: Perquimens 2007

Pamlico 2007

Currituck 2007

Alamance 2007

Davidson 2007

Pasquotank 2008

Beaufort 2008

Hyde 2009

Roanoke sandy loam

Wasda Muck

Pasquotank silt loam

Dragston sandy loam

Kirksey clay loam

Bladen silt loam

Cape Fear silt loam

Ponzer muck

Terral TV21BR40

DeKalb DKC69-71

Pioneer 31G98

Pioneer 31G98

Pioneer 31G98

Pioneer 33M53/57

Pioneer 33M53/57

Pioneer 33M57

☑ 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

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



12 – 12 – 4 @ 20 gal/acre

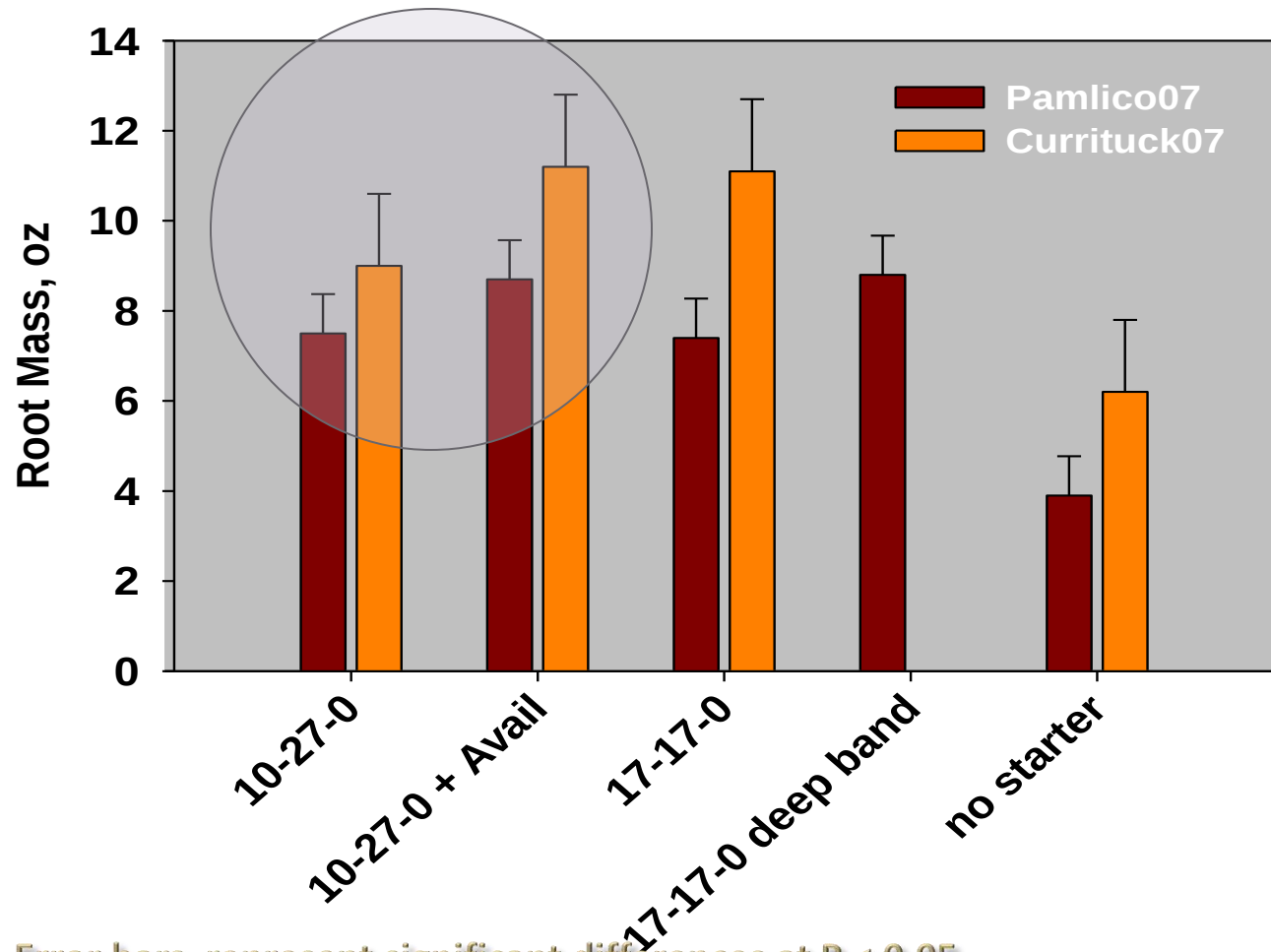


12 – 12 – 4 @ 20 gal/acre
Plus Avail



Root – Shoot – Grain

Differences in Root Mass - 2007



Error bars represent significant differences at $P < 0.05$



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
Pamilico -07	5.3	6.0	5.8	6.1	7.5a	8.7b	0.95a	1.0b
Currituck - 07	3.6	3.7	5.0	5.0	9.0a	11.2b	0.93	0.95
Beaufort - 08	2.6	2.6	4.0	4.3	2.4	2.7	0.74a	0.78b
Pasq. - 08	3.7	3.8	5.8	5.6	4.7	3.8	0.79a	0.83b
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

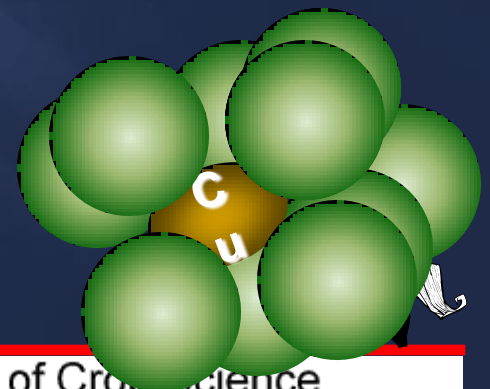
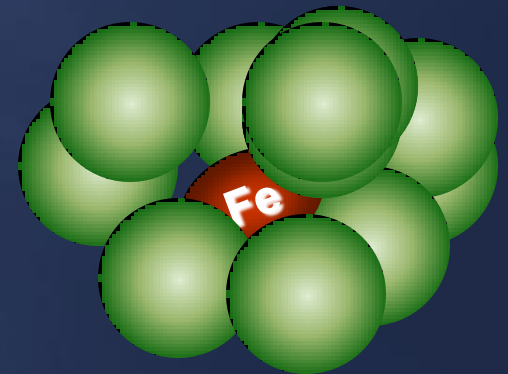
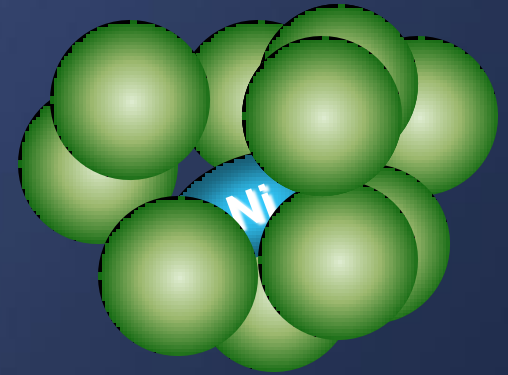
No Starter

Impact of Avail on Yield Across Studies

Location - Year	Blended Fertilizer	Soil P Level	Corn Yield (bu acre ⁻¹)		
			No Starter	Starter only	Same Starter with Avail
Pamlico 07	10-27-0	Med	184.4a	192.4ab	203.5b
Currituck 07	10-27-0	Med	190.8a	200.3a	200.3a
Davidson07	17-17-0	Med	124.0a	144.7b	130.4ab
Guilford07	12-12-4	Low	143.1a	141.5a	165.4b
Perquimans07	12-12-4	Low	130.4a	144.7ab	160.6b
Pasquotank08	10-27-0	High	165.4a	152.6a	160.6a
Beaufort08	10-27-0	High	128.8a	122.4a	127.2a
Hyde09	10-27-0	High	222.6a	225.8a	222.6a
Average			157.4a	167.0b	174.9c

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



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 2008 Main Plots: 30% UAN or 30% UAN with Nutrisphere (planting or layby)
 - 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: Studies Combined by year**
 - Proc Mixed with mean separations using contrast statements

		Nitrogen Rate Code†					
Timing/Year	Nitrogen Treatment	0	1	2	3	4	Average
		----- t ha ⁻¹ -----					
Plant 07	30% UAN	137.5	175.2a‡	175.9a	188.9a	191.8a	173.8A
	UAN + Nutrisphere™	137.5	168.2a	188.6b	199.5a	204.5b	179.7A
N Rate Averages		137.5a¶	171.7b	182.2c	194.1d	198.1d	
Layby 08	30% UAN	88.1a	99.9a	97.3a	109.6a	114.3a	101.8A
	UAN + Nutrisphere™	101.8a	108.0a	114.8b	128.5b	115.0a	113.5B
N Rate Averages		94.9a	104.0ab	106.1bd	118.9c	114.6cd	
Plant 09	30% UAN	117.8	175.2a	185.7a	210.5a	209.6a	179.7A
	UAN + Nutrisphere™	117.8	186.2b	193.2a	216.4a	214.7a	185.6B
N Rate Averages		117.8a	180.8b	189.4c	213.4d	212.1d	
Layby 09	30% UAN	113.0	180.8a	198.9a	212.9a	213.7a	176.3A
	UAN + Nutrisphere™	113.0	183.0a	195.9a	216.6a	220.5a	177.1A
N Rate Averages		113.0a	181.9b	197.5c	214.7d	217.0d	

† Nitrogen rates for each year were: 2007 – 0 = 0, 1 = 50, 2 = 81, 3 = 144, and 4 = 271 lb N acre⁻¹; 2008 – 0 = 30, 1 = 80, 2 = 180, 3 = 230, and 4 = 280 kg N ha⁻¹; 2009 – 0 = 0, 1 = 90, 2 = 130, 3 = 180, and 4 = 230 lb N acre⁻¹.

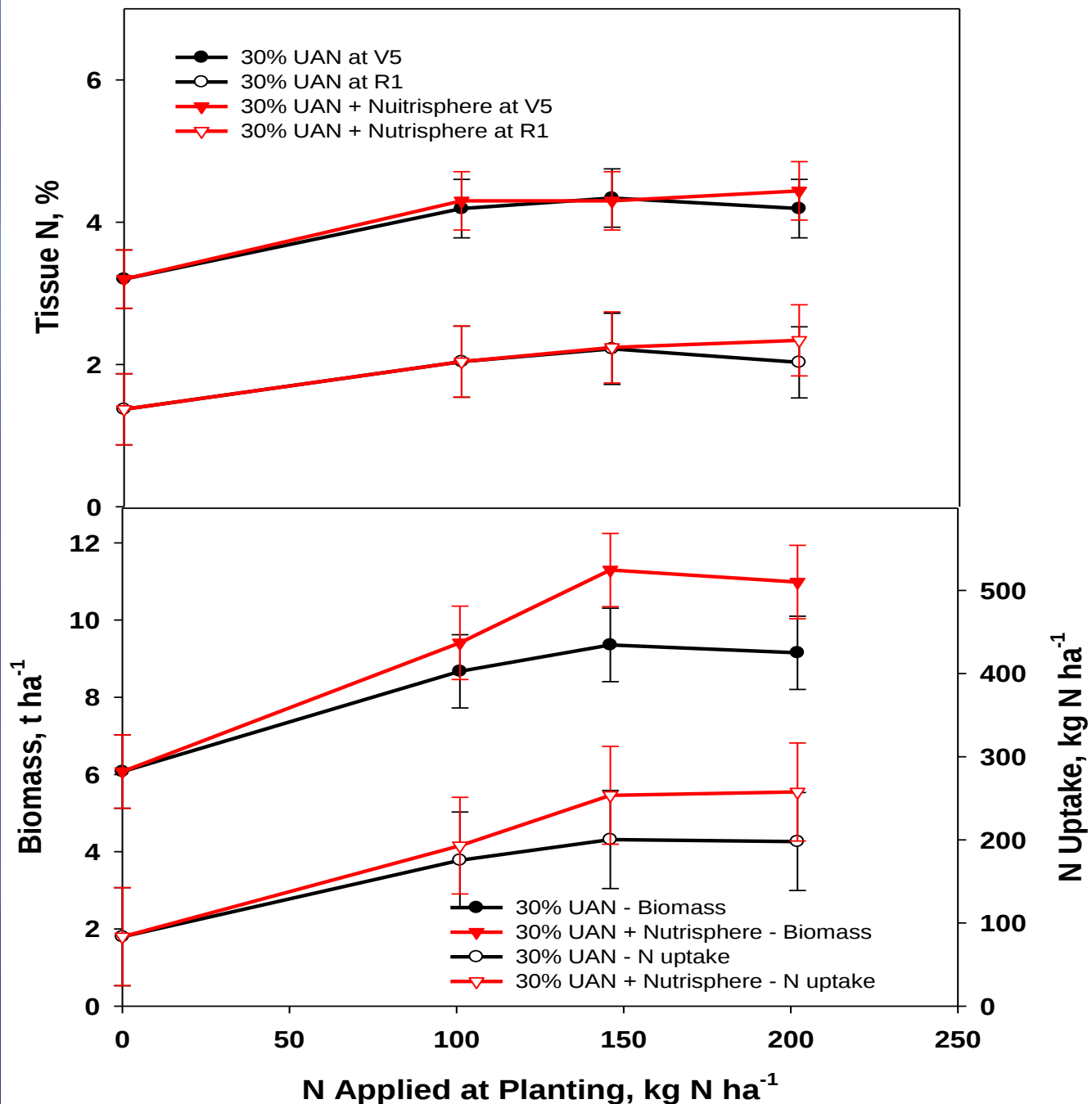
‡ Different letters within each year and rate code column indicate significant differences at p < 0.10.

Different letters within each year under the Average column indicate significant differences between 30% UAN and 30% UAN plus Nutrisphere™ at p < 0.10.

¶ Different letters within each row showing the N rate averages indicate significant differences at p < 0.10.

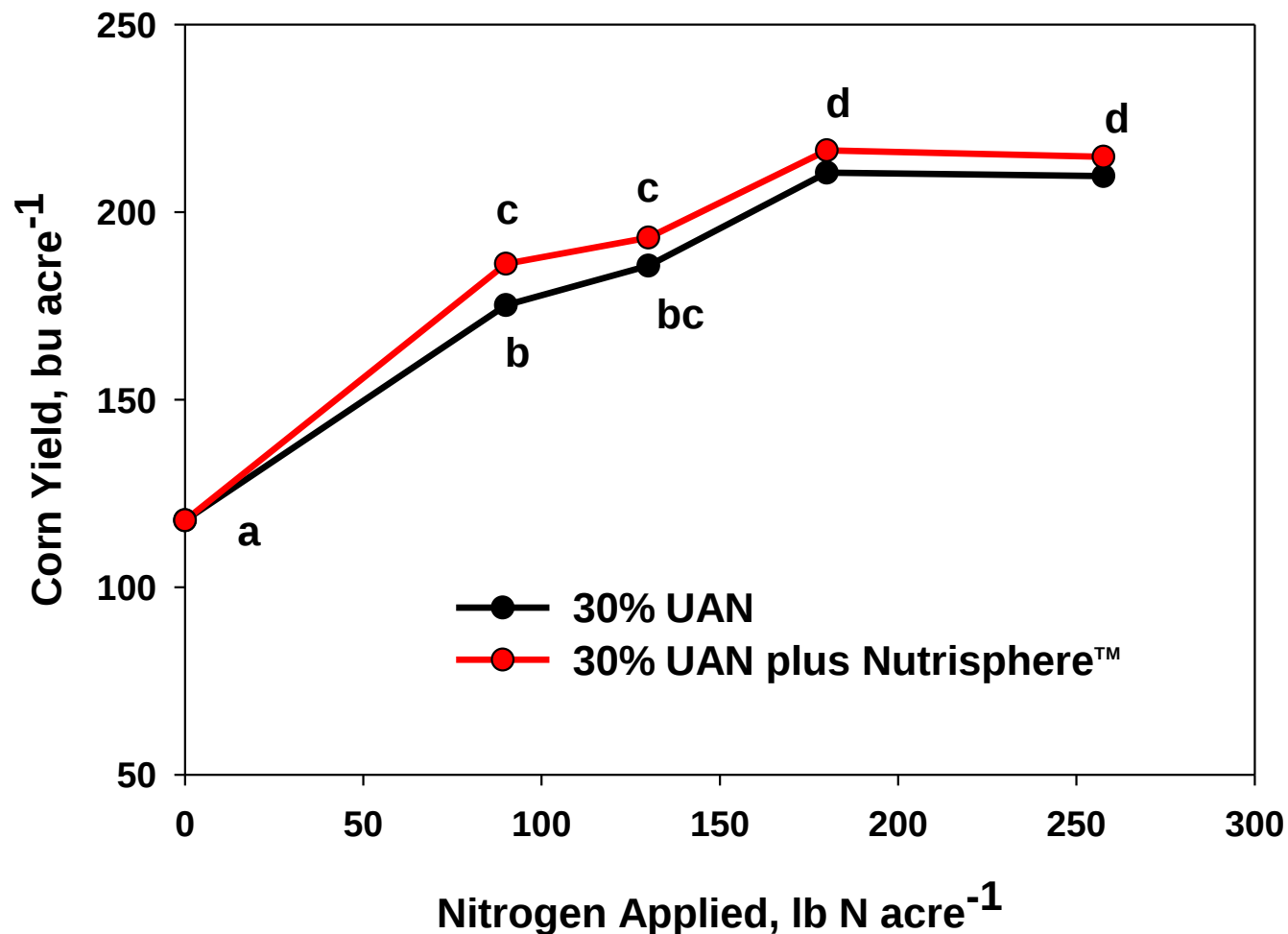
Differences Between UAN and UAN + NSN at V5 and R1

. Error bars represent significant differences at $p < 0.05$.



Pamlico County - 2009

Yield Response to N Source and Rate



Studies Combining Avail and Nutrisphere

☑ Sites:	Forsythe 08	Cecil silt loam	DeKalb DKC61-69
	Guilford 08	Dragston sandy loam	DeKalb DKC61-69
	Columbus 10	Norfolk loamy sand	DeKalb DKC69-40
	Robeson 10	Goldsboro sandy loam	DeKalb DKC69-40

☑ Design: Split plot in four Blocks

Main Plots: Starter treatments – 12-12-4, 12-12-4 with Avail, check

Subplots: UAN, UAN + Nutrisphere

in 2008 two rates - 152 or 184 lbs of N acre⁻¹

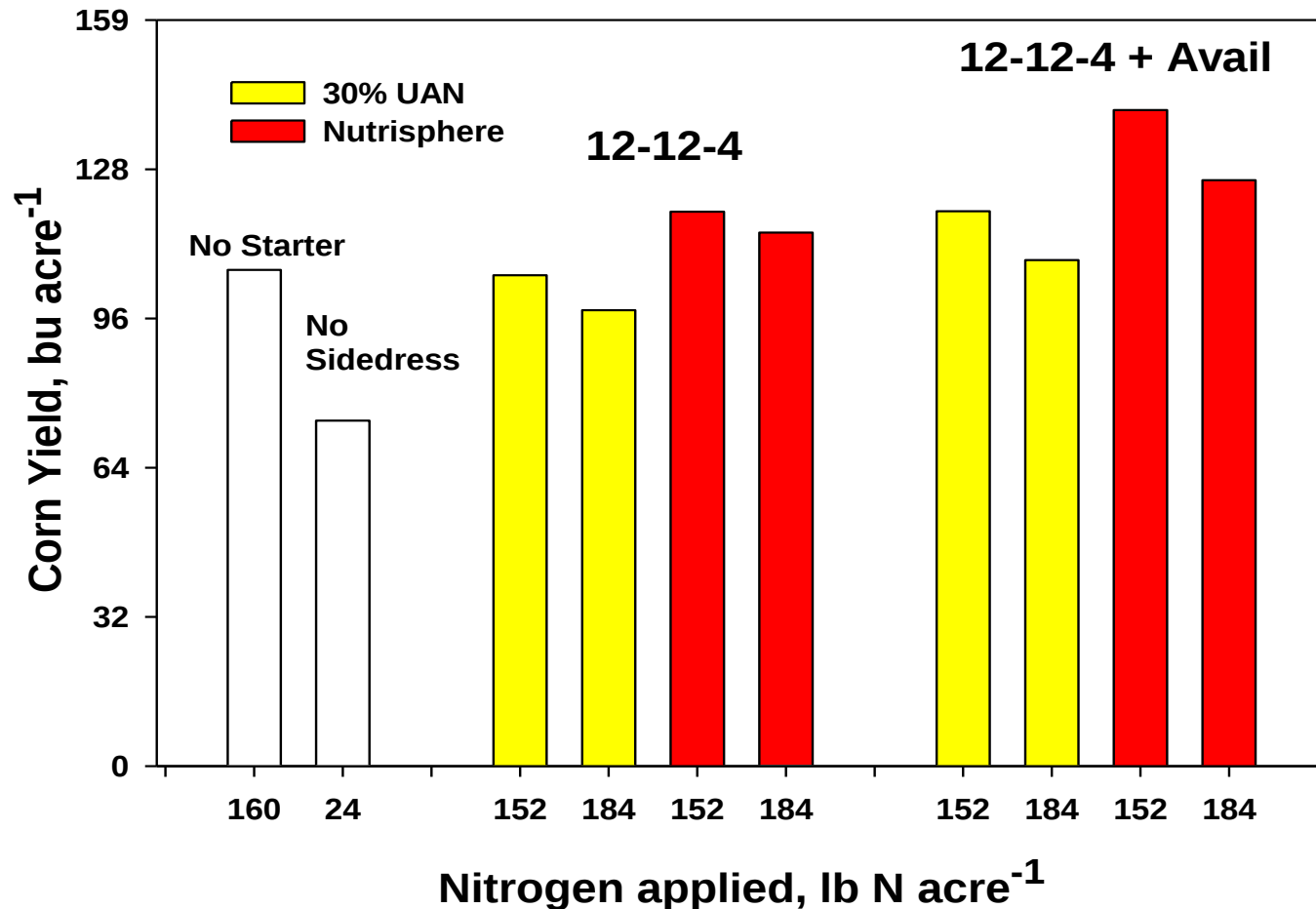
☑ Measurements:
grain yield

☑ Analysis: Sites Combined by Year

Proc Mixed - separations made using contrast statements

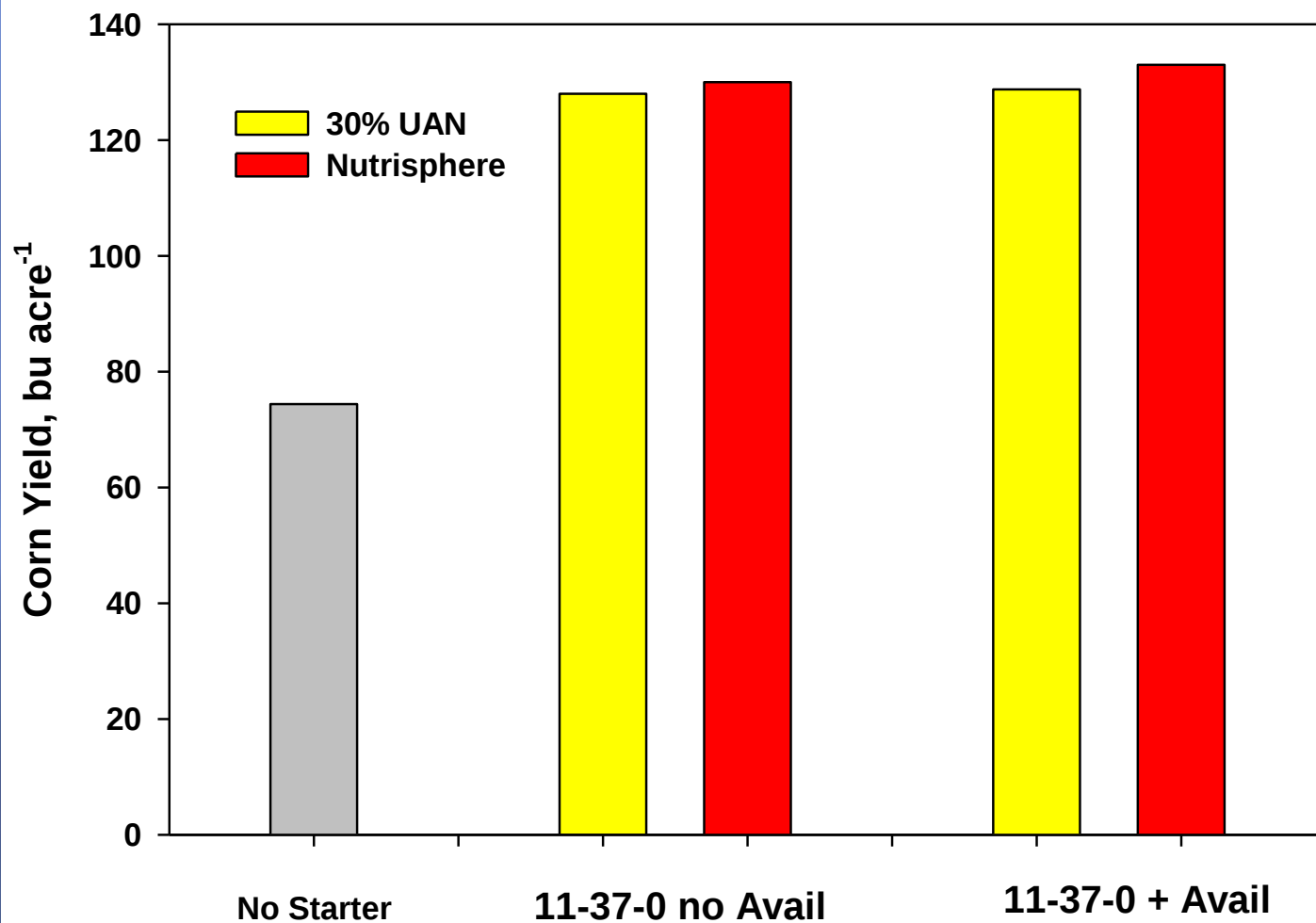


Yield Differences Combined - 2008

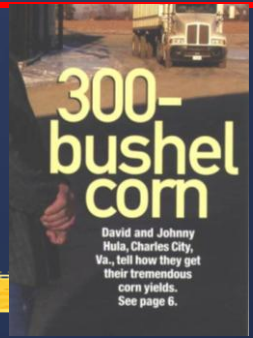


Contrast statements found that when either 12-12-4 or 12-12-4 with Avail™ was used Nutrisphere™ added to 30% UAN significantly increased corn yield compared to the use of 30% UAN alone at $p = 0.0152$.

Yield Differences Combined - 2010



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
- Nutrisphere increased yield by enhancing early growth
- When used together these products are more likely to produce a yield response.





Questions



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

